McGraw-Hill
Publishing Company, Inc.
James H. McGraw, *President*
Mason Britton, *Vice-President*

American Machinist

Editors
Kenneth H. Condit
Fred H. Colvin

Volume 67 | New York, September 1, 1927 | Number 9

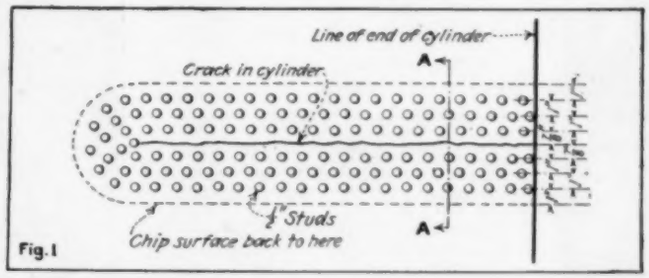
The Electric-Arc Process in Repairing Cylinders

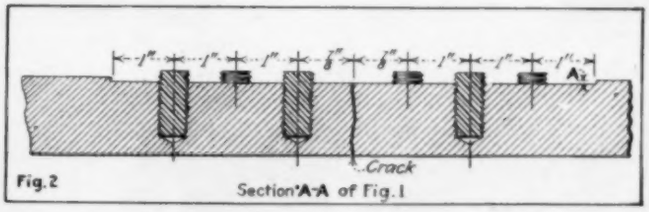
By James M. Vossler
Welding Supervisor, Houston Shops, Southern Pacific Lines

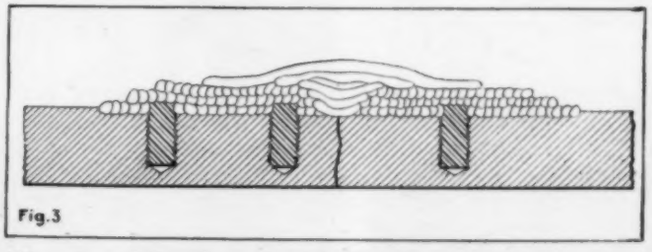
IT IS often advantageous to repair a cracked or broken locomotive cylinder by the electric arc process, as compared with other available processes, due to the short time required to do the work. The process is good when properly handled, but greater precaution must be exercised in making the weld than in welding mild steel, due to the characteristics of the metal.

Locomotive cylinders are made of gray cast iron, an analysis of which will show about the following percentages: carbon 3.50; silicon 1.25; manganese 1.00; sulphur 0.10; phosphorus 0.30. Sulphur is not desired in cast iron, since it makes the metal brittle and increases the tendency to form shrinkage cracks. It is, therefore, held down to a minimum. Phosphorus, likewise, makes the cast iron brittle and weak, and is also held down to a minimum, unless the casting contains thin sections. In this case the phosphorus content is increased, since it increases the fluidity of the molten metal. Although manganese in the amount given above tends to harden the cast iron, it also tends to counteract the bad effects of the sulphur. Silicon in the amount given above tends to increase the fluidity of cast iron, and thereby assists in preventing flaws that are liable to occur in such complicated castings as locomotive cylinders. The solubility of carbon in the iron is reduced by silicon, thereby assisting in the formation of soft, gray cast iron. Carbon is the principal element in which we are here interested. In gray cast iron the carbon occurs in two forms. A small portion is combined with the iron, forming a hard brittle compound known as cementite, or iron carbide. Most of the carbon in gray cast iron is in the form of fine flake graphite, distributed evenly throughout the metal. In white cast iron, most of the carbon is in the combined or cementite form and only a small portion is in the graphite form. When cast iron is molten, all of the carbon is in solution in the combined or cementite form, and if it is cooled slowly, most of the carbon will separate out in the graphite form, thus forming gray cast iron. When molten cast iron is very rapidly cooled, the carbon will not have time to separate out into the graphite form, and the result will be the formation of white cast iron.

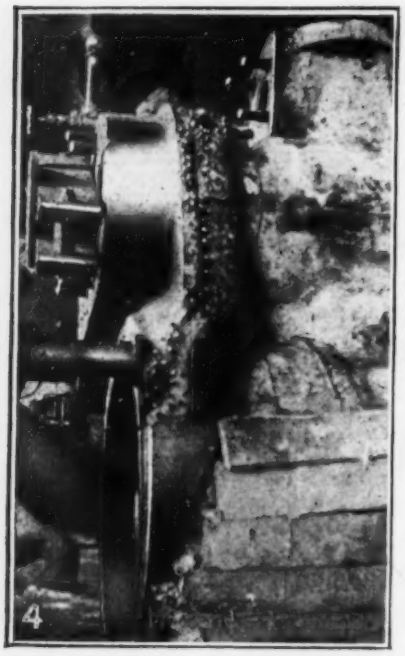
The hardening action due to sudden chilling from high temperature makes the electric welding of cast iron with a steel electrode difficult. When a thin layer of steel is deposited upon gray cast iron, the metal just beneath the deposited metal is transformed into white cast iron. Upon examination, the thin layer of deposited metal will be found to be a mixture of cast iron and steel, and to be very hard, having been chilled by contact with the adjacent metal. Close observation of the beads of the deposited metal will disclose small checks or cracks running across the beads. The checks extend down to the cast iron, though I have never known them to be the cause of any particular trouble. Wherever the checks in the first layer have failed to occur, the deposited metal has, upon complete cooling, separated from the cast iron. Thus, the checks are an indication that the fusion of the deposited metal with the cast iron is good. The checks are caused by the strains set up in the deposited metal, and are due to shrinkage during cooling. The mixture of cast iron and steel in the first layer

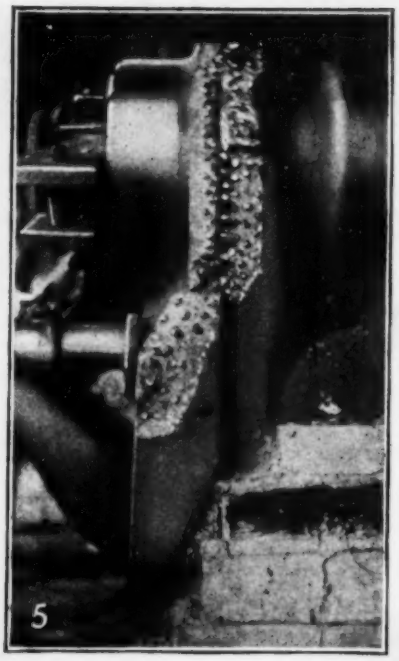


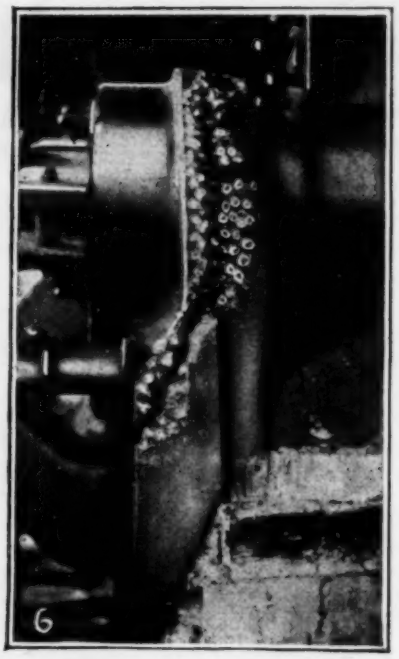


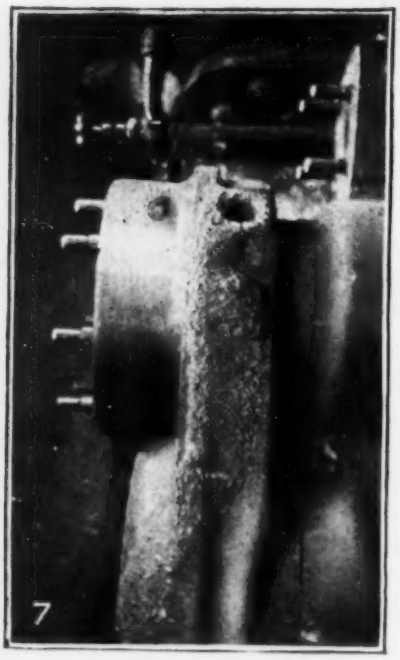


Figs. 1 and 2—Use of studs in arc welding. Fig. 3—How the layers of steel are deposited







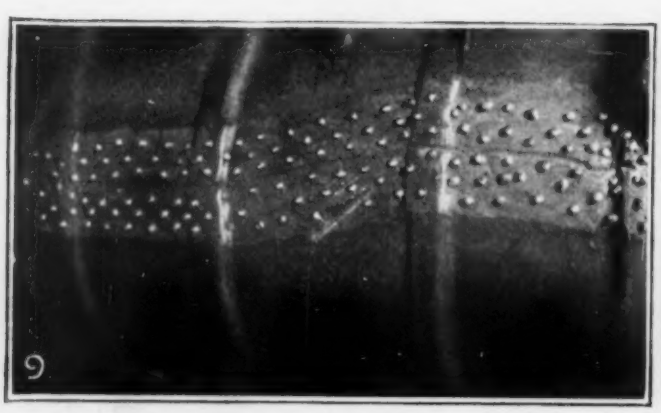


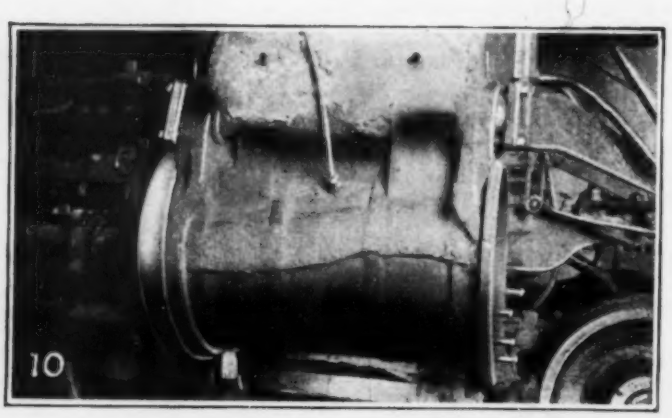
Figs. 4 and 5—A fracture that has been beveled at the edges

Fig. 6—Rings of steel deposited around the studs

Figs. 7 and 8—The completed weld

Figs. 9 and 10—A weld prepared and completed by the method shown in Figs. 1 to 3





of deposited metal is very hard and brittle. Also, it is low in tensile strength and ductility, as compared with steel, but these properties are above those in cast iron. Thus, it is evident that the checks or cross cracks are caused by the fact that the mixture of cast iron and steel has not sufficient ductility to permit it to elongate, and, therefore, the tendency is to either crack the bead of deposited metal or to shear it from the cast iron. When the bead is deposited as thinly as possible, it will cross check before it will shear from the cast iron.

If a second layer of steel is deposited above the first, the checks, or cross cracks, will rarely be found in it. Analysis of the metal of this layer will disclose that it has picked up a mixture of cast iron and steel, due to its penetration into the first layer. The hardness of the second layer is, therefore, increased beyond that of ordinary deposited mild steel, due principally to the carbon, picked up. This hardness increase is not sufficient to prevent machining. The impurities from the cast iron that will be found in the third layer are negligible, while those found in the fourth layer will amount to little better than a trace.

Placing the Deposited Metal in the Proper Spot

Where the point of union between two metals is as brittle as that between steel and cast iron, some extra precaution must be exercised to prevent failure. To accomplish this, the weld is so prepared, where possible, that the union between the deposited metal and the cast iron will be placed in shear rather than in tension. By doing this, a greater area of contact can be secured. For example, if the fracture in the cast iron is beveled on both edges, as is customary in welding steel, the metal that is deposited in the trough cut in the cast iron will be partially in tension and partially in shear. If the fracture is not beveled and the steel is deposited in layers across the fracture, the tendency of the strains will be to shear the deposited metal from the cast iron. The advantage of this latter method is that a greater factor of safety can be secured by covering a larger area with the deposited metal. There are times, however, when the amount of deposited metal that can be built above the surface is limited. At such times, beveling, or a combination of the two methods must be resorted to. When the preparation is by the beveling method, the angle of opening should be as wide as possible, so that the strain in the metal at the point of union between the cast iron and the steel will more nearly approach shear than tension. It might be well to here explain what is meant above by a beveled preparation being partially in tension and partially in shear. If the fracture is so prepared for welding that the sides of the opening are parallel to each other and perpendicular to the outer surface, the union between the parent metal and the deposited metal will be wholly in tension. If the deposited metal is placed upon the surface without cutting out the fracture to prepare it for welding, the union between the deposited metal and the parent metal on both sides of the fracture will be in a plane, and the strain will be a shearing strain. Now, at any angle between these two positions, the strain will be divided between shear and tension in proportion to the angle, and the percentage of either shear or tension can easily be calculated. Another precaution taken in electric welding of cast iron with the metal arc, is the use of studs, as shown in Figs. 1, 2 and 3. When properly used these studs will greatly strengthen the weld. A study of Fig. 3 will show that the studs are more effective in resisting shear than tension.

The following are good reasons for placing all or most of the deposited metal on the surface:

1. Should it be necessary to bore out the cylinder after welding, the operation will not be interfered with by the hardened cast iron that is just beneath the deposited metal.
2. By not cutting out the fracture, less trouble will be experienced from shrinkage strains tending to pull the deposited metal away from the cast iron, leaving it holding to the studs only, though it is then necessary to calk the edges of the weld to make them steam tight.
3. The necessity for removing the cylinder bushing to prepare for the weld is nearly always prevented.
4. Preparation work, such as chipping, drilling and tapping for the studs, is made easier.
5. The studs get a stronger hold on the cast iron than if they were placed in a thin, beveled edge.

The stud arrangement and spacing that has been found most satisfactory, is shown in Figs. 1 and 2. Before laying out the stud holes, the surface is chipped down to a depth of about $\frac{1}{16}$ or $\frac{3}{32}$ in. to remove all dirt, oil and scale from the surface, as shown at *A* in Fig. 2. Fig. 1 illustrates the arrangement of studs around a typical crack in a cylinder, starting at one end running back about two-thirds of its length. Just beyond the end of the crack, one stud hole is drilled entirely through the cylinder wall to arrest the progress of the crack. To prevent leaking, this particular hole is tapped with a taper tap in such a manner that the stud will tighten in the hole when it is screwed about three-fourths of the way through the cylinder wall. The rest of the holes are drilled approximately three-fourths of the way through and are tapped to the bottoms of the holes with an ordinary tap. The studs are $\frac{1}{2}$ in. in diameter and are set approximately $1\frac{3}{8}$ in. apart in the rows.

Positioning the Bolts

It has been found convenient to use two lengths of bolts for the studs. The short bolts are first placed in every other hole and then the longer ones are placed in the intermediate holes, thus, preventing adjacent bolt heads from interfering with the wrench. The difference in length of the bolts is about $\frac{1}{2}$ in. After the bolts are in place, the heads are burned off with a cutting torch, leaving the studs protruding from $\frac{3}{16}$ to $\frac{1}{4}$ in. beyond the surface. This may not appear to be sufficient, but when it is considered that the deposited metal secures a hold, not only on the sides of the studs but on their tops as well, it will be found to be sufficient. There is nothing to be gained by grooving or roughing the cast iron after the surface has been chipped off. Experience has shown that the smoother the surface, the easier it is to fuse the deposited metal to the cast iron.

After the heads of the bolts have been burned off and the cutting-torch scale has been cleaned away, the welding should be started. The fracture should not be prepared for welding long enough ahead of the starting of the weld for rust to form on the bright cast iron, since rust in very small quantities will interfere with the welding process. In dry climates this point may possibly be overlooked, but in damp climates sufficient rust will form over night to be troublesome.

The first step of the welding process is to deposit a single ring of steel around each stud. Care must be taken to secure as good penetration both in the stud and

in the cast iron as is possible. No attempt should be made to build up a heavy ring of steel, since it has been found best to make the ring as light as possible and yet secure good fusion. When the welder has completed the depositing of the ring around a stud, he should not start on an adjacent stud, but should start on another, five or six inches away. This distributes the heat more evenly throughout the entire locality of the weld. If this is not done, there is danger of raising the temperature in a small area high enough to cause further cracking of the cast iron.

After this operation has been completed, a thin layer of steel should be deposited over the entire surface of the cast iron that has been chipped for welding. Care should be exercised to see that the layer of deposited metal does not come closer than $\frac{1}{8}$ in. to the fracture. This layer should be very thin so that checking will take place to prevent the steel from shearing loose from the cast iron. As in ringing the studs, the welder should, after depositing one electrode in a locality, move about five or six inches to deposit the next.

Referring to Fig. 3, it will be noted that three layers of steel are deposited over the cast iron before the fracture is crossed, and that the beads of these layers run parallel to the line of the fracture. It will be further noted that the second and third layers of metal do not go to the outer edges of the weld. This is done to prevent the shrinkage of the steel, upon cooling, from separating the steel from the cast iron at the edge. In all cases where the second and third layers have been brought to the edges, separation has occurred. Near the fracture, the second and third layers are so deposited to form a V-groove into which to place the final and actual weld.

As shown in Fig. 3, a pad of steel is built up on each side of the fracture. If the fracture does not extend from end to end of the cylinder, these steel pads must extend around the end of the fracture, as shown in Fig. 1. Care must be exercised to hold the temperature of the cast iron as low as possible during the welding operation, and yet to secure good fusion. Such a weld should require at least twice the time as it would to deposit the same amount of metal on steel.

Bridging the Space

After the three-layer pad has been completed, it is best to discontinue welding until the metal becomes cold. After this the final welding can be started. This consists of bridging the space left between the two steel pads. It should be started at one end of the fracture and, after one electrode has been deposited, the welder should move to a position about five or six inches away and deposit another electrode. This is done to render the strain of contraction as even as possible, and should be carried out with all of the layers. The last layer, as shown in Fig. 3, should extend from the center of one pad to the center of the other. This type of weld is shown in Figs. 9 and 10. In no case, where the above procedure has been followed, has it been found necessary to calk the edges of the weld to prevent leaking.

In Figs. 4 and 5 will be seen a fracture that has been troughed out for part of its length, while the middle portion proceeds through a location that provides a natural V. The chipping extended about one-half way through the cast iron. Along some portions of the fracture, only two rows of studs could be placed. The fracture extended through the center of the valve observation hole. Fig. 7 shows the manner in which the welding was handled around the hole. The deposited metal was not placed sufficiently close to the edge of the hole, either to damage or to harden the threads. The portion of the fracture that extends through the cylinder-head seat, was brazed with an oxyacetylene torch. The electric welding process was not used on the seat, because a weld made by the electric arc would be so hard that the seat could not be machined.

A fracture that extended from the cylinder through a port into the valve chamber, is shown in Figs. 4 and 5. In the illustrations will be seen the manner in which the fracture was closed prior to welding, by means of a jack and a large bolt running through the center of the valve chamber. In Fig. 6 will be seen the steel rings that have been deposited around the studs. Figs. 7 and 8 show the completed weld. This cylinder has been in service two and a half years and no trouble has been experienced with it.

A cylinder fracture, prepared as illustrated in Figs. 1, 2 and 3, is shown in Figs. 9 and 10, partially and wholly completed.

Wages Are Not All—Discussion

By Thomas E. Warburton

IN REPLY to an article by John Homewood on page 920, Vol. 66, of the *American Machinist*, I take the liberty to state that another reader agrees with William Stepanoff that there is no glory in being a machinist. The feel of the caliper, and having the ability to caliper a hole a mile away, and come back to the lathe and make a shaft to fit the hole without the aid of a micrometer does not "butter any parsnips." The factor that counts today is what you get in your envelope, and fascination and glory of a job well done loses all its glory if the recompense is not adequate.

I have been a machinist almost half a century, starting in as a boy, when we had no electric lights, no air drills; when the man with the ratchet drill was a very important individual. I have two sons. I got them apprenticed as machinists thinking it would be a splendid business for the young men. They finished their apprenticeships and worked as journeymen for three or four years when they "got wise." They laughed at me and said: "Dad, the machinist business is the bunk," and they got into another occupation. Today they start work at 8 a.m., one hour for lunch, and finish at 5 p.m., two weeks' vacation with pay every year, and the remuneration they receive is above anything they could have gotten in the machine shop. Can you wonder that they laughed at the "old codger" who thought that the business of a machinist was something to be proud of?

If the economic conditions will not allow the employer to pay a rate of wages to match living costs, then there is something wrong. The machinery builders have helped to make huge fortunes for manufacturers with the labor saving tools that they and their staff have designed, and it is time that the machine tool builders recognized this fact and sell their product so they can make a decent profit and pay the machinists a wage equal to that of other trades.

If you allow a man to use a machine that is improperly protected, or to neglect the use of guards that you provide, at least part of the responsibility for accident is on your shoulders.

Automotive Production

The Air-Cooled, Radial "Wasp"

An airplane engine of 425 nominal horsepower

By Ellsworth Sheldon
New England Editor, American Machinist

SIGNIFICANT of the trend of airplane engine development in the United States is the fact that all of the planes used by the trans-oceanic flyers were equipped with air-cooled radial engines. The extreme lightness per unit of power of this type of engine is inherent in its design, but the gratifying reliability it has displayed under all conditions of service must depend to a large extent upon the accuracy of the workmanship entering into its construction. The record-making planes were driven by engines of 200 horsepower. In this and following articles the constructional details of a considerably larger unit of the same general type will be considered.

The "Wasp" engine, made by the Pratt & Whitney Aircraft Co., of Hartford, Conn., weighs about 650 lb. and develops from 415 to 425 horsepower. It has nine cylinders, 5¾ in. in diameter, radially disposed around the periphery of a symmetrical crankcase at the center of which is the crankshaft. The economical manufacture of a machine so highly specialized, in which great power is concentrated in so small compass, and in which the utmost degree of reliability in service is of such vital importance, involves not only careful design of the machine itself but the development of many special tools and fixtures by means of which precision of result may be attained without sacrifice of time. Moreover, though a manufacturing proposition, the building of this engine demands workmanship of an unusual degree of skill and a rigidity of inspection comparable with the highest class of tool work.

For the design of the engine as well as for the development of the tools and fixtures wherewith it is built, no small measure of credit is due to Charles J. Marks, production engineer; D. L. Brown, factory manager; and J. J. Borrup, production superintendent—three men who have been associated in automotive engine design and construction since the days of the Simplex automobile.

The central body of the engine in which all of the principal working parts are enclosed is composed of four principal sections called, collectively, the crankcase. In the order of their arrangement in the engine these sections are designated as the front-section, the main-section (made in two parts), the blower-section, and the rear-end. The front section encloses the large-diameter ball bearing that is situated immediately behind the hub of the propeller to transmit to the frame of the airplane the thrust developed by the engine, and also the cam and its train of driving gears to actuate

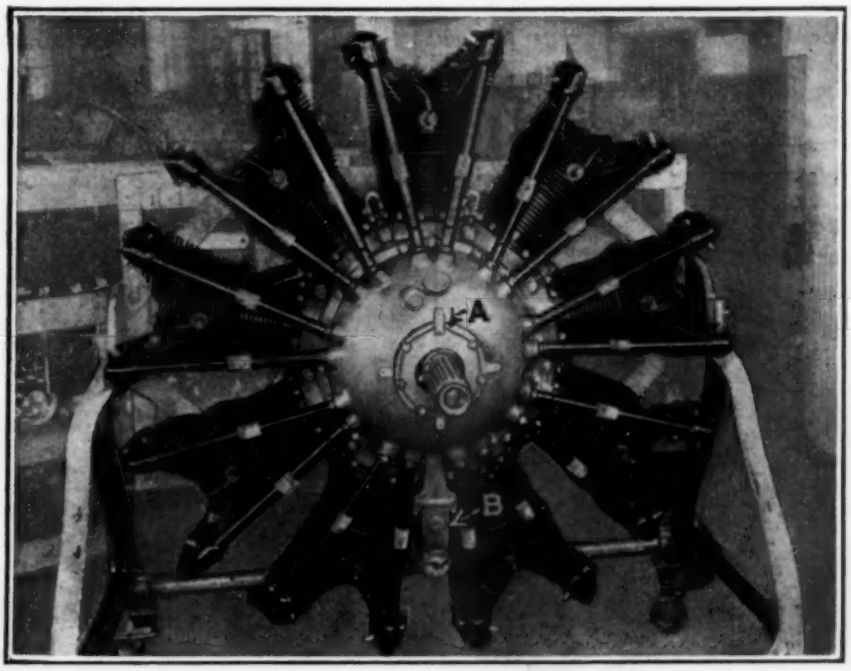
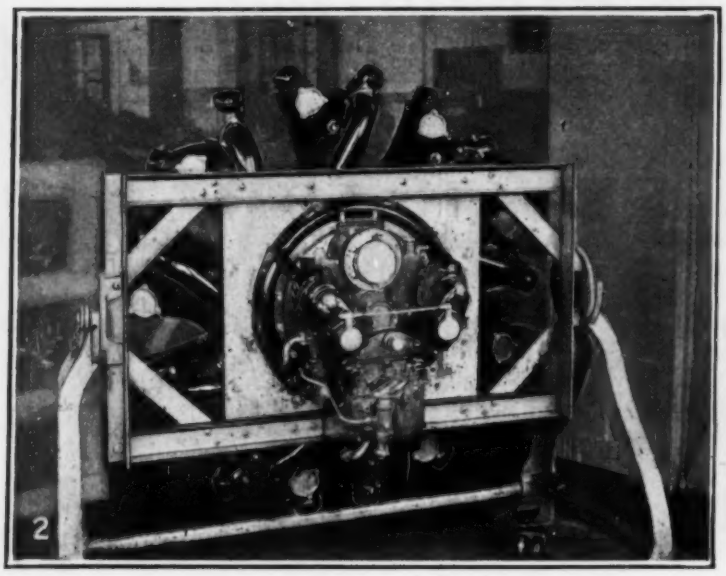


Fig. 1—Front view of "Wasp" engine. This engine has just been brought in from a run of several hours on the test stand and will be partly disassembled for inspection and final adjustment—a regular procedure with all of these engines

The first of a series. The second will appear in an early issue.

Automotive Production



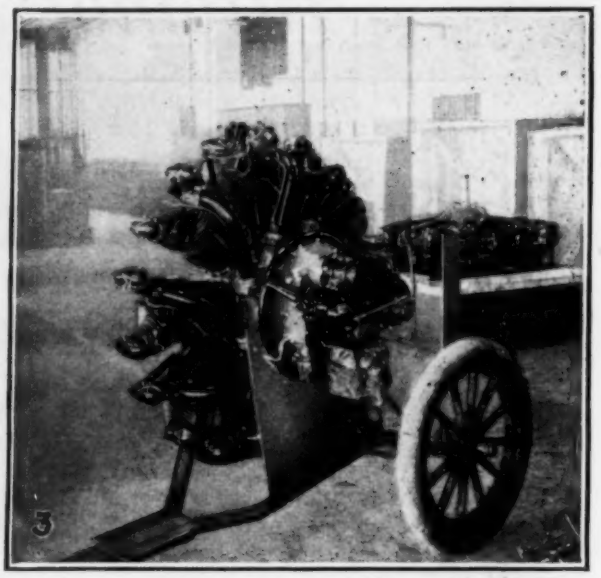


Fig. 2—Rear of "Wasp" engine on assembly frame. The panel on which the engine is mounted may be swung about a horizontal axis to any angle for convenience in assembling. Fig. 3—A two-wheeled, pneumatic-tired truck is used to transport the engine about the shop

the valves located in the heads of all of the cylinders.

Next is the main section, in the front and rear walls of which are the main roller bearings upon which the crankshaft rotates, while between the walls are the single crank and the nine connecting rods by which the reciprocating movement of the pistons is converted into rotation.

The third section is called the blower for the reason that at the center of its chamber is the rapidly revolving impeller of the supercharger which discharges the mixture of gas and air through tangential openings and suitably connected conduits to the intake valves, and thus delivers it to the cylinders under pressure, instead of depending upon the suction of the pistons. This section might with equal propriety be called the gear case, for within it is practically all of the toothed gearing through which the auxiliary machinery is driven.

The fourth, or rear-end, section carries the auxiliary machinery necessary to the functioning of the engine. A double carburetor to supply the explosive mixture; two magnetos, each connected to separate spark plugs in all cylinders, to fire it; a circulating oil-pump to deliver lubricating oil under pressure to all rotating bearings; a fuel pump to convey gasoline from the tanks to the carburetor; and a mechanical starter by means of which the aviator is enabled to set the engine in motion without outside aid, comprise the auxiliary equipment.

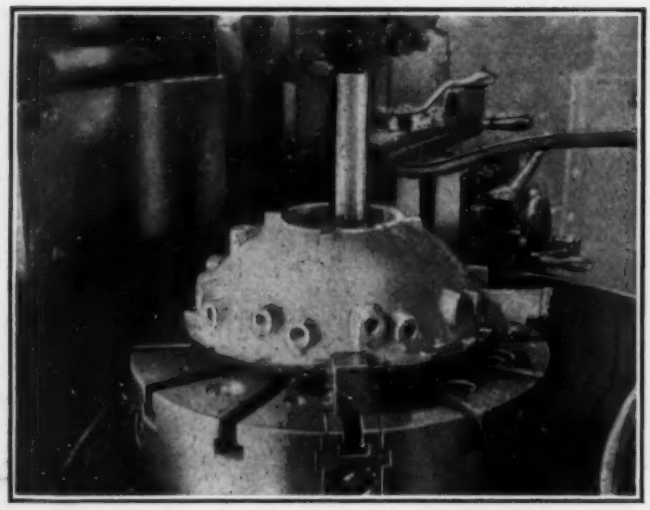


Fig. 4—The front section is bored on a Bullard vertical turret lathe to take the outer race of the large ball bearing that sustains the thrust of the propeller

Three of these sections are made of aluminum castings. The main section is a drop forging—or, rather, two identical drop forgings—of Duralumin. This first section of the article will be confined to the description of some of the more unusual operations, and to the tools and fixtures employed in connection with them.

The illustrations, Figs. 1 and 2, show, respectively, the front and rear of a Wasp engine that has just been returned to the assembling department from a run of several hours under its own power on the testing stand. It is to be partly disassembled, its working parts inspected and readjusted, and reassembled; a regular procedure with all of the engines made by this company. The wheeled stand upon which it is mounted is one of many in the assembling department on which the engine is built up. The panel of the stand may be swung about a horizontal axis to any convenient plane.

Another and clearer view of the rear may be obtained in Fig. 3, where the engine is mounted upon a two-wheeled, pneumatic-tired truck by which it is transported about the shop. On this, as on the assembly frame, the engine is attached to the steel plate by the bolts that are to hold it in its final position on the airplane.

The first machining operation on the aluminum casting for the front section, which is the part to be seen at *A* in Fig. 1, is to bore the central opening to take the race of the thrust bearing immediately behind the propeller hub. The work is done in a Bullard vertical turret lathe with the casting held in the chuck of that machine. The operation, shown in Fig. 4, is to rough and finish bore

Automotive Production

the hole and form the seat for the bearing, and to face off the small diameter flange.

The part then goes to the lathe shown in Fig. 5, upon the faceplate of which is located by permanent dowels a fixture that has at its center a hardened and ground steel plug to fit the newly finished bore of the casting. The latter is wrung upon the stud and secured to it by a slip-washer and a bolt tapped into the center of the stud. Offset studs in the base casting of the fixture bear against some of the many bosses on the convex side of the work-piece to do the driving.

In this second operation the rabbeted flange is faced and its short, projecting shoulder turned to fit tightly into a corresponding recess in the front half of the main section. This fit is called in shop parlance the "snap," and is depended upon to make an oil-tight joint, not only here but at all places where complete sections of the case join. The radial projection that may be seen at the top of the casting in this view is the connection through which oil in the crankcase flows to the sump; which is the part to be seen at *B*, in the front view of the assembled engine.

The fixture to be seen in Fig. 6 is used under a Barnes single spindle drilling machine to guide the drills, reamers, counterbores, etc., used to machine the radial openings into which the valve tappet guides are to be set. There are eighteen of these holes, arranged in two circles of nine equidistantly spaced holes each.

The base of the fixture, which cannot be seen in the illustration, is clamped to the floor plate of the machine. The body of the fixture, *A*, is so mounted in a channel way in the base that it may move radially to and from the column of the machine. Upon the upright face of the body is mounted a rotatable indexing plate *B* which may be locked by a bolt, operated by the lever *C*, in any one of the eighteen corresponding positions.

Integral with the body of the fixture is the bracket *D*, on which the bushing plate *E* is slidably mounted and secured by the cap-bolt *G* which passes through a short slot in the plate and taps into the bracket. The squared stud *H* extends through the bushing plate and bracket to the base of the fixture, in which it takes a bearing. Eccentric shoulders on this stud cause a relative movement of the parts when the stud is turned. A projection on the collar of the stud, striking against one or other of the pins *J* in the bushing plate, limits the amount the stud can be turned.

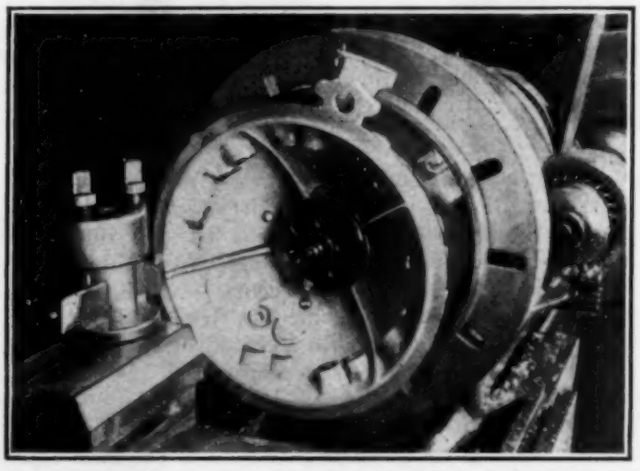


Fig. 5—The flange of the front section is rabbeted to fit a recess bore in the flange of the main section. This fit is called the "snap," and must hold hot oil

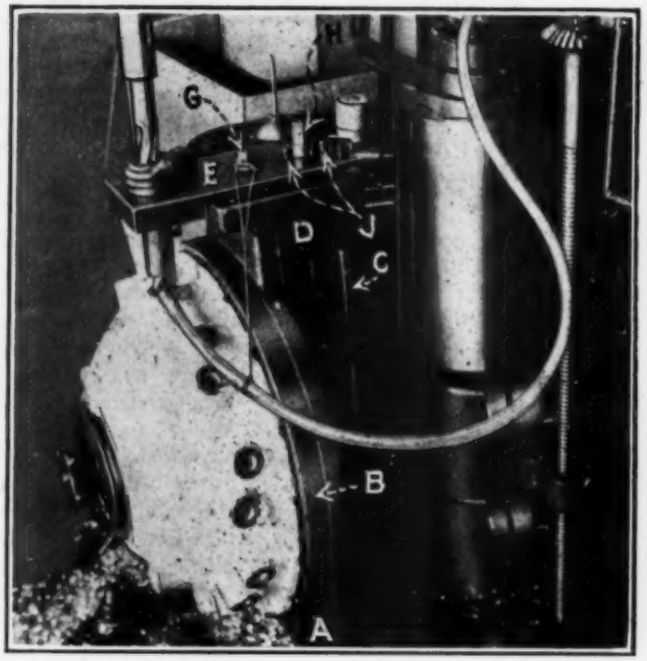


Fig. 6—An indexing fixture is provided with which to drill, ream and counterbore eighteen radial holes in the wall of the front section to receive the valve-tappet guide bushings

When the cap-bolt *G* is loosened and the stud *H* turned with a wrench, the base and the bushing plate remain stationary while the body of the fixture, carrying the index plate and work, slides inward or outward a distance equal to the axial separation of the two circles of holes. As the work may be started on either circle, the adjustment need be made but once for each part machined.

Covered by the front section, but having its bearing upon the front wall of the main-section, is the single cam that actuates the valves of the engine. This is a plate cam, having upon its periphery two sets of four lobes each, offset from each other axially by a distance sufficient to allow the intake and the exhaust tappets to work without interference. The cam is driven from the main crankshaft through a train of speed-reducing gears, one member of which has internal teeth. The cam rotates in reverse direction at one-eighth the speed of the crankshaft.

Giant fans, similar to those used for ventilating may be tried in airports, to whip up 65-mile wind gales for the safe landing and take off of airplanes. It is hoped that the use of these big fans, with other methods for scientifically controlling air conditions, will make it possible for planes to land on the tops of buildings or within a city block. The gale created by the blower fans can supply "braking power" for planes when landing, and will minimize the risk both of starting and landing.

Book Reviews

STATICS AND THE DYNAMICS OF A PARTICLE. By William D. MacMillan, Professor of Astronomy, University of Chicago. Four hundred thirty pages, 6 x 9 in.; cloth-board cover. Published by the McGraw-Hill Book Co., 370 Seventh Ave., New York, N. Y. Price $5.

THIS is a modern text book on theoretical or analytical mechanics, primarily intended for the use of students in our colleges and universities who are interested in astronomy, physics, or mathematics. It should also appeal to that group of engineers who wish to extend their knowledge beyond the mere rule-of-thumb into the deeper foundations and developments of general theory.

Although to a limited extent vectors are introduced into the treatment of the subject, they do not require any knowledge beyond ordinary geometry, trigonometry, elementary algebra and, in the latter part of the book, some working knowledge of the elements of calculus, especially when we come to the dynamics of a particle—but this is obviously unavoidable in such a study.

The book is divided into three main parts: the fundamental concepts of mechanics, statics, and the dynamics of a particle. Part I treats with vectors, velocity acceleration, mass and force, work and energy; also geometrical concepts such as the center of gravity and moments of inertia. Part 2 deals with the statics of a particle, then with the statics of ridgid bodies, embracing the displacement of rigid bodies, moments of vectors, theorems relating to couples, virtual work, stable and unstable equilibrium, and frameworks. Then comes statics of deformable bodies, dealing with funicular polygons, catenaries and elastic solids.

The main divisions of Part 3 (dynamics of a particle) have to do with straight-line motion, curvilinear motion, central forces, constrained motion, the generalized coordinates of Lagrange, and finally with the general principles of mechanics.

The difficulties of the subject make many problems desirable, and many problems have been furnished in the text with all the answers for checking purposes.

YEAR BOOK ON COMMERCIAL ARBITRATION IN THE UNITED STATES, 1927. Prepared by the American Arbitration Association, 342 Madison Ave., New York City. Published by the Oxford University Press, American Branch, 35 West 32nd St., New York. Cloth, 6x9½ in., 1,152 pages. Price $7.75, post-paid.

THIS is the first of a series of standard publications on arbitration being prepared under the direction of the Research and Publications Bureau of the American Arbitration Association. This Year Book describes in great detail the existing machinery for the arbitration of commercial disputes. The extent and availability of these facilities will probably come as a surprise to many business men and industrialists.

The body of the book is a complete outline of the existing arbitration arrangements in practically every important industry. Each industry is treated separately with details of the arbitration procedures now in use by its various societies and trade associations. Readers of *American Machinist* will be interested in the sections dealing with the following industries: construction (architects, owners, engineering societies, and numerous associations of builders and contractors); financial organizations, fuel, heat, light and power.

This treatment by industries is followed by a description of the arbitration rules of the U. S. Chamber of Commerce, the International Chamber of Commerce and local Chambers all over the United States.

The great mass of material it contains is no hindrance to the convenient use of this Year Book. With the aid of name and subject indexes the busy executive can quickly locate those sections relating to arbitration as it exists today in his particular industry or field of work.

ECONOMIC DEVELOPMENT OF THE UNITED STATES. By Isaac Lippincott, Professor of Economic Resources, Washington University. Seven hundred seventy-one pages, 5½x8 in. Cloth boards. Indexed. Published by D. Appleton & Co., New York. Price $3.50.

THIS is a second, revised edition of the book first brought out in 1921. It is an economic history particularly relating to the great growth of the development of the raw products and resources of the United States, and to the advance in manufacturing and commerce. In this latter connection are included historical facts relating to the foundation and growth of commercial organizations, banking, and labor and tariff problems. Particular attention is given to the periods succeeding the Civil War, when the greatest manufacturing expansion occurred, and the new additions to the book cover the newer features of economic development since the World War, especially along the lines of organized markets, management, and industrial education.

The book is divided into five parts and twenty-eight chapters. The first part takes up the factors underlying economic development, such as the people, government, and resources of the country. Part two then reviews the colonial period and the development under the colonial systems of trade, agriculture, and manufacturing. The founding of the national industrial system is the general subject of the six chapters in part three, the two chapters on manufactures and commercial expansion from 1790 to 1860 being of special interest. The expansion of national industries from 1860 to 1914 is then taken up in part five, and the economic changes during and since the war are reviewed in the last part. In revising the last parts of the book the author has brought his general information down to 1926, and much of the statistical data to the years 1923 and 1924.

DIRECTORY OF COMMERCIAL TESTING AND COLLEGE RESEARCH LABORATORIES. Thirty-nine 7½x10¾-in. pages. Paper covers. Published by the Bureau of Standards, Department of Commerce, as Miscellaneous Publication No. 90. Price 15 cents. This booklet contains a list of 207 commercial testing laboratories throughout the country, with a classification of the types of materials which they are prepared to test for individuals or commercial firms. Due to the large amount of testing work which the Bureau of Standards has to do for other government departments it has been found impractical for the Bureau to make tests for private concerns if other laboratories can do the work. This list, therefore, should be a valuable aid to concerns that have no laboratories and require occasional tests of materials.

Cutting and Soluble Oils

By H. L. KAUFFMAN
Consulting Petroleum Chemist and Lubricating Engineer

Soluble compounds in paste form are useful where it is difficult to use liquid lubricants on the work—Care and handling of compounds

SOLUBLE compounds, or cutting compounds, are similar to water-soluble oils, but instead of being in liquid form they are made in the form of pastes. As marketed, cutting compounds are usually in a semi-solid or semi-emulsified condition, and contain from 10 to 70 per cent of water.

Like most water-soluble oils, soluble cutting compounds are usually combinations of oils and soaps. These paste cutting lubricants are generally used on work that is of large size, and particularly when portable tools are used. In many cases the cost and the difficulty of application are the main objections to the use of a lubricant in liquid form, in which instances the use of cutting compounds in paste form is most advantageous. However, paste form lubricants that are used as such, without the addition of more water to form a cutting emulsion, possess but little cooling effect. Only when a cutting emulsion is made by adding more water to the paste, and this emulsion then used on the work, is the maximum cooling effect obtained from the product being used.

The use of cutting compounds in paste form completes the discussion of these materials. General suggestions for the proper employment of cutting oils, and personal care in their use is contained in this article

Many cutting oil pastes are manufactured that are recommended for use only after having been mixed with water to form a soapy emulsion. These emulsions are then used similarly to the way in which other types of cutting emulsions are employed. Usually such paste-form lubricants emulsify better if they are mixed with hot water. Many of them have to be stirred frequently after having been mixed with water in order to prevent the separation of oil. In general, paste-form cutting compounds are favored for use on large rough work where cheapness of the cutting lubricant is a primary factor.

The method of making a paste-form cutting compound that is said to give good results is as follows: Two thousand pounds of yellow cup grease is heated with 260 lb. of oleic acid until all the grease is liquid; then is added caustic soda solution made by dissolving 60 lb. of caustic soda in 50 gal. of water. After the addition of the caustic solution the mass becomes thick, and brown in color. Water is then added until the mixture reaches the consistency considered the most suitable.

Cutting emulsions generally are considered to be aqueous emulsions formed by mixing soluble oils or soluble compounds with water. The quantity of water used in making the emulsion may be as much as 30 times the amount of oil or paste that is used, the proportion depending upon the composition and characteristics of the oil or paste and the particular conditions of operation. So-called soda mixtures are used in nearly all machine shops for cooling the work. A mixture of soda and water is a more satisfactory coolant than clear water alone, especially with ferrous metals, since soda serves as a rust preventive. In drilling or cutting hard materials such as glass, manganese steels, and other materials of like nature it is frequently necessary to make use of liquids which have the property of aiding the cutting edge in taking hold of the material and in starting the shear line. Liquids possessing this characteristic are sometimes classed as "mordants," a word derived from the Latin word meaning "to bite." Turpentine, used either alone or mixed with camphor, is a commonly used mordant. A solution of camphor gum in turpentine, when used in drilling or cutting hard steels, increases the speed of cutting; increases the "bite" of the tool into the work; and helps in preserving the cutting edge. Certain resin oils also seem to possess this property of making the tool bite into the work.

It is worth noting that different materials require different classes of oils and emulsions for lubricating and cooling the work; and furthermore, that the form of the compound used depends greatly upon the type of machine and the method of circulating and supplying the compound to the tools. For example, in working such materials as copper, aluminum, bronze, or brass, a particular problem is encountered in each and requires especial consideration as to the type of cutting lubricant or coolant that will prove most suitable. Copper and aluminum require some thin fluid such as kerosene. Solutions of kerosene and the different animal oils in varying proportions, or even mixtures of these oils with either mineral lubricating oil or turpentine, or both, are used in machining and cutting operations on different materials. Experimental mixtures usually are made to ascertain the most suitable cutting oil for the particular material under manufacture.

The following general remarks can be made upon the influence of the cutting speed and the depth of cut in the proper selection of cutting lubricants:

The third and last article of the series.

1. When a light cut is being made and the tool speed is low, little cooling and little lubrication is required, and a cutting oil of low viscosity will suffice.

2. With a deep cut and a low tool speed the important factor is lubrication, and a cutting lubricant possessing great oiliness, such as a compound mineral oil, should be used.

3. Where the cut is light and the tool speed high a large amount of heat is generated, and hence a cutting medium with great cooling properties should be used, therefore a water-soluble oil emulsion is generally to be preferred.

4. When the cut is deep and the speed is high, both cooling and lubrication are involved. Under such conditions a light mineral oil, that will cool the work rapidly, compounded in large proportions with an animal oil, such as lard oil, which will lubricate, usually must be employed.

Methods of Application

Cutting lubricants and coolants may be applied by: (1) Squirting upon the work from an oil can. (2) Drop feed from a reservoir fixed in a suitable position above the work. (3) Circulating over and over again by means of a pump, which is either operated by the machine itself or independently operated and serving a group of machines. The two first-mentioned methods are used only for cutting operations at slow speeds where cooling of the work is of little importance. In most cases, however, efficient cooling is required, and hence the use of a circulating system is the most widely employed method of applying cutting lubricants, especially when the machines are operating at high speed. In general, the pipes delivering the oil to the cutting edge should be as close to the edge as possible. Furthermore, these pipes should have wide mouths in order to reduce the viscosity of the cutting lubricant as it is applied to the work. Whatever the method of application followed, care must be taken to prevent excessive splashing, for great savings in consumption of cutting oil can be made by paying attention to this detail.

The primary cause of skin troubles among workers exposed to mineral cutting oils is the irritating action of chemical ingredients, such as chemically combined hydrocarbon sulphonates, in the oil. These become deposited in the hair pockets and the pores of the skin, and irritate the lining of the cells. Another factor which contributes to the irritation of the skin is the presence in used oil of fine particles of metal and other foreign matter, which cut and abrade the skin, more especially so when the workman wipes his hands and thus clogs the pores. Inflammation sets in, and the hands and arms show the presence of red spots with a black center, or, in the case of abscess formation, of a yellow head. In this condition entrance is afforded to the germs and bacteria which are present. Infection results, and the inflamed areas advance to the stage of pimples containing pus, these pimples in severe cases becoming boils. As a rule bacteria are not originally contained in the oil, but get in through such unsanitary practices as spitting in the oil.

As hydrocarbon oils of the paraffin series also possess properties that are irritating to the skin, cutting oils of a low wax content are, from a hygienic standpoint, to be preferred. The use of a non-irritating oil is one of the greatest factors in the prevention of skin trouble.

Other preventive measures are the personal cleanliness of the worker and the filtration and sterilization of the oil. The arms of the workman should be thoroughly washed at least twice a day, for which purpose a supply of mildly germicidal soap, hot water, brushes and towels should be provided. Oil that is used over and over again should be filtered to remove the fine metal particles and other suspended matter present, and should be sterilized at regular periods of time by heating to 140 deg. F. for from 20 minutes to an hour in order to kill germs and bacteria.

The following suggestions and precautions are given as an aid in keeping skin diseases at a minimum:

1. Do not wash the hands in a common supply of oil or gasoline; if necessary use individual bottles of cleaning oil.

2. Do not wipe used oil from the hands, but bathe it away instead.

3. Use gloves and lightweight arm guards made of oilcloth, if desired; but if they are used, they must be kept clean.

4. Keep work-rooms and quarters sanitary, clean the machines frequently and remove from them all accumulations of old lubricants.

5. Use vaseline, carbonized cosmoline, or some other suitable ointment on the hands and arms if they show a tendency to become dry and to crack after washing.

6. Dusting the hands and arms with a powder containing equal parts of zinc oxide and starch before commencing work is a wise precaution.

7. Above all the workman must be cleanly, be familiar with the precautions necessary to prevent skin infections, and place himself immediately under medical care should any wounds or skin eruptions appear. Any workmen who are subject to chapped hands, rashes, and other skin irritations, or who seem to be particularly susceptible to the action of cutting oils, should be transferred to other work.

Standardized Electric Motors —Discussion

By R. J. Owen

Sales Engineer, The Louis Allis Co.

On page 248, volume 67 of the *American Machinist*, I note an article under the title given above in which a statement is made that the British Thomson-Houston Co., Ltd., is now in position to offer a line of interchangeable a.c. and d.c. motors. This article further refers to the American motor builders as not being entirely ingenuous.

Approximately three years ago the Louis Allis Co. completed the development of new a.c. and d.c. lines of frames which were designed with the a.c. and d.c. frames, rating for rating, interchangeable in mounting. This design has been carried out in connection with the standard a.c. 60-cycle and d.c. rating, these being the ones most generally used.

[The statement in the editorial referred to was too sweeping and Mr. Owen's statement pointing out what has been done by his company is appreciated and is published as our correction.—Editor.]

Percentages do not always mean what they seem. Adding two men may increase the personnel in one shop 100 per cent and not be worth counting in another shop. Actual numbers or dollars mean more in most cases.

Abstracts of New Haven Papers

These papers are to be presented Sept. 6 to 9 at the First National Meeting of the A.S.M.E. Machine Shop Practice Division, and the New Haven Machine Tool Exhibition, Mason Laboratory, Yale University, New Haven

Education for Foremanship

By JAMES A. MOYER
Director of University Extension, Massachusetts Department of Education

FOREMEN must be interested in the idea of foremanship training in very much the same way as the new methods of production and personnel management are laid before them. Foremanship training is valuable if for no other purpose than to make the foremen understand and appreciate the aims of the management in connection with production methods, personnel relations, and similar activities.

During the past few years marketing problems have become acute, and as managing executives have become more absorbed with these problems, their contacts with the foremen have dwindled. Under these conditions, there has been a tendency for the foremen to get sidetracked. It is easy for the executive officers of an industry to make important decisions, which seriously affect the work of the foreman and of the men under him, over the foreman's head or behind his back. The new types of industrial organization increase the responsibilities of foremen and relieve them of some of the former routine, thus making them more important men in an industrial organization. Because of the increasing importance of foremen, special training is needed.

THE "DRIVER" IS PASSING

The practical foreman realizes that it is necessary to understand the aims of the management and the fundamentals of the industry. He stands as the intermediary between the management and the men. It is that stragetic position and his response to the assistance offered which has brought about such a wide interest in the improvement of foremanship. The old type of driving foreman is passing. The new type of leader of men will come when the management is willing to train him.

Foreman training must be initiated, supported, and followed up by the management. This requires the personal attention of some one who possesses not only initiative but tenacity of purpose. No undertaking of this kind can be carried out successfully in an atmosphere of doubt or suspicion. The nature of the group meetings demands an open discussion of plant problems which may involve the company policies.

It is important that the foreman get a real view and an adequate understanding of what the management has in mind in promoting foreman training. Loyalty is based upon understanding. Where the contact exists, one finds the origin of harmony or discord. On the other hand, in foremanship groups where some representative of the management sits in with the foremen, the foremen are inclined to talk as they think the management would like to have them. Most often the management gets from the foreman what he thinks the management would like to hear.

The average foreman is a man of medium age with but little schooling beyond the grades. He seldom does much reading for improvement other than what he finds in trade journals. He is not given to discussing his most troublesome problems because of his inability to speak fluently. He prefers to be silent rather than to venture a statement in regard to a problem which he has not completely analyzed. The progressive element in foremanship consists usually of those men who realize that they must fit themselves for increasing responsibilities, and must keep up with the latest improvements in shop practice and management.

One of the most important factors in the success of a foreman-training project is that those in the group should be men who have approximately equal rank. The reason is to insure full and free discussion. It is seldom that this kind of discussion is obtained when an executive of higher rank attends the meetings. Likewise assistant foremen seldom feel free enough at a meeting of this kind to utilize the advantage of the work to the utmost. General experience indicates that the training work should be carried on at one level. The management may keep fully informed of the progress of the work without being present at the meetings.

NEUTRAL ORGANIZATION

It is natural to ask the question "What does the foreman need in the way of training or education?" It is apparent that the most valuable help is afforded by assisting the foreman to organize his knowledge and experience so that he can use it to the utmost. An equally important objective is that of giving him a definite picture of his responsibilities as a foreman, and a consideration of his contribution to the efforts of the organization. Some training courses have failed because they have been almost entirely informational rather than developmental in character.

Any text which is used for study should serve to acquaint the individual with the general principles which apply to the duties of foremen, and tend to stimulate interest in thoughtful discussions. The application of these general principles to the particular problems of

foremen are, of course, brought out during the class or group discussions. It has been found that a foreman can seldom contribute much to a conference unless he is familiar with the fundamentals underlying industrial organization, production planning, personnel control, and costs. If the text material presents these subjects in language which is easily understood, it is of value in providing the necessary educational background. A foundation knowledge of this kind, reinforced by problems, conferences, and discussions, forms a satisfactory basis for operation. The use of ordinary academic textbooks on management is seldom satisfactory for foreman-training classes.

The conference and discussion method as compared with the lecture is far more stimulating, because it encourages active thinking on the part of the individual. The faculty of constructive thinking is more valuable than mere knowledge, for the real measure of accomplishment is permanence of results.

Some topics for discussion which can be handled with profit are job analysis, plant-organization, interest in the job, production, lowering costs, laying out work, distribution of supervision, carelessness, leadership, reports, records, apprentice training, co-operation. It is obvious that the discussion method of instruction could not be used with such topics as wage policy, selling, costs, and marketing; not at least until a considerable amount of direct information had been given to the group by some executive of the company. Again, the handling of such topics as first aid and the treating of workers involves ability to perform before any discussion is of value. These points bring out the importance of obtaining an instructor who is familiar with many phases of industrial management.

A suitable place in which foremanship class or group meetings may be held is necessary. The type of room may vary from an executive's office to a corner of the factory. The only requirements are enough space, suitable light, heat, ventilation, and chairs. A large blackboard is needed as well as some arrangement to allow men to take notes. The degree to which informality is preserved, together with the absence of artificial restraint, will have much to do with the response.

The cost of foreman training will vary, depending upon the plan of operation. It is difficult to measure the return on the investment. The experience of many industries has shown as a result a noticeable improvement in morale, production, costs, and labor turnover. The rapid growth and permanent status of foreman training is due to the fact that it is one solution to the problem of increasing the morale of men as members of a manufacturing organization.

Developments in the Application of Anti-Friction Bearings to Machine Tools

By R. F. RUNGE
Vice-President SKF Industries, Inc.

TO THOSE in the machine-tool industry who were pioneers in the application of anti-friction bearings, credit is due for breaking down many of the old prejudices. This has resulted in a decided advance and change of opinion during the last two years throughout the industry, so that we find today many important applications of anti-friction bearings in locations which only a short time back were considered questionable. The result obtained required improvement in material, character of finish, and closer tolerances, accompanied by metallurgical and physical research and also experience gained through use in the field.

Anti-friction bearings, to be successful, must show many times the life of the older forms of bearings or considerably less maintenance, resulting in greater number of productive machine hours. The application must be one which is more foolproof than the older types of bearings, where a scraping-to-fit is necessary or adjustments are required. This is becoming more and more important as a greater amount of unskilled labor is finding its place in industry.

The next item of importance is the use of a bearing which has the absolute minimum of friction. This is quite obvious, as friction means wear, and wear definitely defeats accuracy and quantity of production. In this connection, it is unquestionably a fact that the more modern types of ball bearings, made to extreme accuracy and of the highest quality of material, will provide the least friction, and for the same reason require the minimum adjustment.

Heating on precision machines is of decided importance, as it will be immediately understood by those who are closely engaged with machine operations on precision work that such machines do not produce close tolerances consistently until the machine has attained its operating temperature. This materially affects machines in which automatic gaging of certain forms is used, so that machine heating due to friction in bearings plays an important part in percentage of scrap production.

The machine-tool manufacturers have been most cautious in the past in considering the application of anti-friction bearings to such parts as milling-machine spindles, grinding-wheel spindles, and work-head spindles on the various types of machines. This is to be expected due to the requirements of consistent accuracy of performance and also due to the failures of past years, when the bearings had not been developed to as high a standard as at present, and improper types as well as improper mountings were used. (The author then gives numerous examples, with illustrations, of the successful application of anti-friction bearings to lathes, milling machines, and grinders, showing in each case the features that determine the success of the bearing.)

Proper lubrication for ball bearings is important, although it is commonly known that they require a very small amount of lubrication. It is necessary, however, that they be of proper consistency, and care should be taken to use a lubricant free from acids and foreign matter.

There have been certain tendencies toward the use of

grease in precision and high-speed applications. Grease may be used under certain conditions, but due to the great variety of viscosities of grease, and also the numerous fillers which are used, grease lubrication is subject to a wider range of variation and is therefore less controllable. For such applications as have here been discussed, years of experience have very definitely shown that oil lubrication is preferable.

Where grease is used, there is grave danger of generating additional heat through churning. This is also true where the bearings are partly submerged in a reservoir of oil. In the designs presented the oil is fed through a wick as a filter. Where automatic lubrication, or a centralized system, is used for all of the bearings on a given machine, this same principle of lubrication can be applied. This principle of lubrication cannot be too strongly emphasized, as foreign matter and improper lubrication in any type of bearing are injurious.

The importance should be emphasized of making a careful analysis of the conditions to be met in the various types of machines; that full advantage should be taken of the information the bearing manufacturers are in a position to supply, and that standardization should be kept in mind. It is fair to say that the initial installation of ball bearings, if made standard practice on machine tools, should show very little, if any, higher cost than many of the present types of sliding bearings, to say nothing of the decidedly lower maintenance costs of ball bearings. A safe prediction would be that the next important step in the way of improvement will be a more general adoption of ball bearings as standard equipment in the machine-tool industry.

The Economics of Machine-Tool Replacement

By Myron S. Curtis
Potter & Johnston Machine Co.

THERE is no question but that the period of enormous expansion in every manufacturing line, and particularly in the automotive industry, which has been witnessed in the last fifteen years, has ceased for the present. While it is entirely possible that there may be extensive development and expansion of certain lines, which will in turn affect certain branches of the machine-tool industry, still it is extremely doubtful that we shall see any general expansion. For example, the automotive industry is beginning to realize that it must depend for its dividends upon increasing the profit per unit rather than upon increasing production. As opposed to this we find the machine-tool industry in an over-expanded condition due to the enormous demands made upon it by the growth of the automotive industry and by the conditions brought about by the World War. Also, machine tools of today are of a much more rugged nature, and are more foolproof in construction than those of a few years back, thereby extending the life of the machine tremendously. Again, improvements in the design of machine tools have generally increased the productive capacity from fifty to in some cases six hundred per cent, again reducing the potential market. It is easy to figure that if a tool put out by a machine-tool maker today will do twice as much work as one put out by him five years ago, all other things being equal, he will only sell one half as many machines as formerly.

Must Develop New Tools

Outlet must be found for a reasonable percentage of the capacity of the machine-tool industry. If it cannot be absorbed by expansion it follows that it must be absorbed by replacement. This, in turn, may be caused either by the development of improved methods of manufacture, that is to say the replacement of a machine tool by one of an entirely different nature, or else by improvements in the machine tools themselves. The machine-tool builder always will have an increased field by developing improved methods of manufacture, not only in hundreds of shops where obsolete methods of manufacture exist, but even in the up-to-date production shops.

The tendency to cling to obsolete machinery simply because it is in good condition and is capable of doing the same amount of work which it did when it was installed, will eventually put any concern out of business. There should be no more hesitation in scrapping an old or inefficient machine than there is in getting rid of inefficient men. As a matter of fact, the obsolete machine is a greater liability to the plant than the inefficient man.

Causes of Obsolescence

Two things make a machine tool obsolete. The first is the nature of the tool and the way it has been treated; and the second is the developments of the art through which the tool produces more than the one it supplants. In regard to the first reason, a tool may be in such shape that it is unable to produce sufficiently accurate work, or it may be that repairs are too frequent, and result in excessive waste of productive time. A machine tool may be obsolete for the work it is performing, but may be economical on some other job. In such cases the tool should be transferred to the other work and a new tool provided. If, however, there is no job on which the tool can be economically placed, it should be immediately scrapped.

The second reason for machine-tool obsolescence is due to improvement in the art. The machine-tool industry has made enormous strides in the last five years. During the war a machine-tool builder was able to sell the capacity production of his shop, and therefore the manufacturer was not particularly interested in making any radical changes in his product. Immediately after the Armistice, however, conditions changed, and the market for machine tools became a buyer's market instead of a seller's market. This caused the manufacturer to start redesigning and improving his line, so that today it is safe to say that nearly every type of machine tool built prior to 1921 is obsolete for production. The machine-tool builder is designing to make feeds and speeds which were unheard of even five years ago, and is taking full advantage of the developments in high-speed cutting tools. Five years ago the art of making cutting tools was far ahead of machine-tool design. Few if any machines were capable of forcing high-speed steel to the limit. Today this condition has changed, and the capac-

ity of the modern machine tool is dependent upon the ability of the cutting tool to stand up. Of course, all machines built five years ago are not obsolete for all classes of work. Certain jobs are inherently too weak in themselves to withstand heavy feeds and speeds, or can be machined just so fast because of the distortion due to heat and the limits required.

Thirty years ago most machine tools, especially those of British manufacture, were extremely heavy. Gradually the lines were refined and excess material was done away with. Then came the introduction of high-speed steel, and nearly every machine tool on the market proved to be too light to withstand the heavy duty imposed. The metal which was removed has been gradually put back. Today, machines are made not only strong enough to withstand the strains imposed, but also heavy enough to absorb all vibration at the cutting edge of the tool.

There is a definite tendency toward the use of alloy steels for shafts and gears. This is a direct result of knowledge gained from the automotive industry, and today, every good machine tool has its high-duty gears and shafts made of heat-treated alloy steel. Another direct result of the influence of the automotive industry is the use of anti-friction bearings.

Increased convenience of operation has been accomplished by well-thought-out design in the grouping of levers, the accessibility of change gears and cams, etc., all of which cut down the setting-up time materially, and by reducing fatigue, make it possible for the operator to produce more work in a given time on a given machine.

More foolproof construction is absolutely necessary today, as the class of help operating machine tools under production conditions has definitely changed to unskilled labor. A production tool is no longer operated by a mechanic—a man who understands its various functions, and who takes pride in keeping his machine running efficiently. This type of man can no longer be found in sufficient numbers to operate our shops. The use of interlocking levers, safety devices such as slip frictions and shear pins, and, on some of the simpler tools, hydraulic feeding mechanisms is therefore noted. The matter of oiling has also received considerable attention. Five years ago most machine tools were oiled by the old-fashioned oil can and the tool with any well-thought-out system of oiling was an exception. Today are to be noted the use of enclosed gear boxes running in oil, mechanical oiling systems such as have been for a long time used on engines, unit oiling systems usually with a sight-feed drip whereby one or two oil reservoirs oil the whole machine, and the one-shot oiling system.

These three general developments, namely, increased power and rigidity, increased convenience for the operator, and foolproof construction, have resulted in an enormous increase in the productive capacity of machine tools, and increase in production hours because of freedom from breakdowns. (The author then gives examples of modern labor-saving machine tools, and some savings derived from them.)

Shop-Equipment Policies in Representative Plants

By L. C. MORROW
Managing Editor, American Machinist

THE term "shop equipment" in the metal-working industries properly includes all of the equipment used within the shop, but it is obviously impossible to treat of each kind of equipment in a paper that will not be unduly long, except as the principles laid down for one class may be applied to the others. It is with machine tools, primarily, that every metal-working shop is concerned, and therefore it is with keeping machine tools up-to-date that this paper deals.

The United States census of manufactures gives the value of machine tools produced during 1925 as $148,598,285, or $126,916,000 excluding portable tools, parts, and attachments. The average value per machine was $1,506. Since 1914, while the population of the United States has been increasing 18 per cent, the productivity of the nation has increased 35 per cent, a rate almost double. In these thirteen years, the automobile industry has multiplied almost eightfold in the number of cars built per year and over sixfold in the total annual value of the product, yet with a steady decrease in the hours of human labor per car. Seven years ago, one man could handle only 800 tons of pig iron per year. Today his capacity is 1,200 tons a year. Eight years ago a pair of shoes required one hour and forty minutes of human labor. Today a pair of shoes requires but 54 minutes. The machine has brought about this advance everywhere in national productivity, this decrease everywhere in the number of human-hours or human-minutes per piece, per ton, per dozen, per acre.

In the past thirteen years, over 6,500 new metal-working machines and tools have appeared on the market—improvements on old types, new developments, new creations of mechanical genius—all designed to increase output and accuracy, and to reduce upkeep and labor.

It is gratifying that there is a growing recognition of the importance of the machine-tool industry in the economic scheme. An indication of this increasing recognition is the thoroughness with which many large users of machine tools are studying their equipment problems from the engineering and profit points of view.

Equipment is discarded because it is worn out or because it is obsolete. Almost all machine tools are made up of several castings proportionately large, with smaller parts of other materials. There is seldom a great amount of wear on the castings, and the deterioration of cast iron is not rapid. Inasmuch as wear upon all parts is seldom uniform, it would seem that if each part were replaced as it became worn the machine would never wear out. Experience proves, however, that there is a relation between the cost of repairs and the cost of new machines, that, if determined accurately, will indicate when expenses for repairs are no longer justified. The repair cost is being maintained by some of the largest users of machine tools. If the plan should be adopted universally much of the ancient equipment now in use would be withdrawn from active service. Moreover, the records of the costs of repairs, used with the records of initial costs, would enable all users of equipment to arrive at sound rates of depreciation.

One manufacturer gives the definition of obsolescence

by saying that a machine is obsolete when it will no longer pay the dividends obtainable from some other machine. Another, that obsolescence as applied to productive machine tools is the result of the elimination of uneconomical manufacturing operations. Still another, that a machine tool is made obsolete by the development of the art through which the modern tool produces more than the one it supplants.

There arises the question, "How much better than the old must a new machine be?" It seems that the concensus of opinion is that it must be very much better indeed. The automotive industry is very strongly inclined toward the belief that the new machine must pay for itself from increased earnings within one year. Other manufacturers, whose products include tractors, ball-bearings, automobile starting, lighting, and ignition systems, universal joints, vacuum sweepers, roller bearings, cash registers, and machine tools, vary from a limit of one year to a limit of several years.

Discarded equipment is disposed of by being sold to other users; by being sold to dealers in used equipment and by being scrapped. As the scale is descended from the high-production shop and the shop working against keen competition, it is found that there is a market for discarded equipment in the shops where not so much is required from a machine and where competitive conditions are not so severe. Whether the machines are sold direct to the new users or to dealers in used machinery depends upon market conditions, and the effort that the seller is willing to make to find customers.

Among certain users of machine tools there is a policy not to allow discarded machines to stand around for long periods. If there is no market available within a reasonable length of time after the machines are taken from the equipment, they are broken up for the scrap. One of the reasons advanced in favor of rapid disposition is that antiquated machines have a bad influence upon shop morale when they stand around.

To some extent the selection of single-purpose or standard machine tools is comparable to the selection of one or the other type of drive. Some manufacturers lean very heavily toward the special, single-purpose machine, even when no such machine is available on the market, but must be designed and built in their own factories. There are others who will go out of their way to stick to standard machines. In favor of the single-purpose machine is the fact that it can be shown to pay on work of great volume and of fixed design.

One of the advantages of up-to-date machine equipment is the effect upon employees. It is only human nature to want to live in a modern house, to own an automobile with the latest improvements, and to want to work with the latest equipment. It is not uncommon for managers or equipment engineers to believe that there is a noticeable increase in production when new and modern equipment is used, due to its effect upon the morale of the operator and aside from increase due to the greater productivity of the equipment.

Modern machinery has taken much of the onerous heavy labor from the backs and hands of the workman. Power rapid-traverse mechanisms have eliminated the heavy and time-wasting cranking formerly necessary to elevate and traverse heads and tables. Improvements such as push-button control have reduced danger to both machinery and men and have saved much time. Proper guards have greatly reduced the hazards of machine-shop work, have saved much suffering and much money. Convenient controls have added to the day production, and have made it possible for the operators of the heaviest machines to leave the shop after a day's work still fresh. These improvements, inherent in up-to-date equipment, have benefited industries greatly because of the increased satisfaction of the shop personnel.

There is more to the equipment problem than I have told. There is a great deal more that I do not know. I have been glad to contribute what I could for two reasons: To help bring to the attention of those users of machine tools who are not keeping their equipment up-to-date those instances in their plants where the judicious spending of money on new equipment will pay them a profit; and to help to uncover for the machine-tool builder those opportunities for sales that are hidden because of the failure of those responsible for equipment to understand the possibilities of the machinery available to reduce costs. (The author cites numerous cases of definite shop policies.)

The Prerequisites of Successful Polishing

By Bradford H. Devine
President Devine Bros. Co.

THE term polishing as it is used in the metal-finishing industry, is a misnomer. Strictly speaking, the term should be applied only to those operations which produce luster, but in industry it is applied to three distinct processes—flexible grinding, polishing, and buffing. Polishing is a very old art, and while it has become one of the largest and most important departments of metal manufacture, it has not been developed along engineering lines as have other departments. It has been, with some exceptions, a matter of rule-of-thumb, tradition, or just plain habit or ignorance.

The industry, in general, is in a state of chaos. Costs are altogether too high, mechanical operations are often performed in a crude and inefficient manner, and standardization is absent. Polishing is one of the things which have developed from the experience of the workman rather than through scientific investigation. As a result, we have an industry in which engineers and executives have, until recently, manifested little interest.

Polishing begins in the drafting room. The article to be polished should be designed to eliminate all unnecessary projections, depressions, angles, recesses or reverse curves, which can be polished only with narrow or small wheels at excessive costs. Usually the cost of any extra metal involved can be more than offset by the saving in polishing.

The polishing department receives the work in either rough or tooled condition. When castings are to be polished without previous operations, they should be as free as possible from excessive sprues, ragged edges, lumps, or other surface defects. With forgings scale should be removed by pickling or other methods. In

drawn or stamped work deep drawing marks or scratches caused by imperfect dies should be eliminated by correcting the dies. Work which is tooled, or which is ground on solid wheels, should be so processed that the surfaces will not be too rough. Work should be delivered to the polishing department in such condition that it will not be necessary to correct the errors of other departments. The cost of correction in the polishing department usually exceeds the cost in the department where the incorrect condition originates. There is often continual strife between the polishing and other departments on this point, whereas care in planning would prevent such conditions.

The absence of vibration is necessary for successful polishing. A vibrating wheel makes scratches which cost time and money to remove. A polishing wheel works at best efficiency only when the entire face of the wheel comes in contact with the article being polished at every revolution of the wheel.

Causes of Vibration

Vibration comes from several sources—the building, the machine, or the polishing wheel. The building may be of light construction, or the floors may be too light to provide a sufficiently rigid foundation for the machine. The machine may be too light, or not well designed. It may not be properly secured to the floor, or may not have the necessary rigidity in the column, the shaft, or the bearings. The polishing wheel may be of such a type, or may be so designed, that it is difficult to balance. Then, too, the wheel may be so headed that high spots or hard spots are developed, which throw the wheel out of balance.

Fatigue of the operator is another reason for eliminating vibration. In a plant in which had been installed wheels of a type which ran much more smoothly than those previously used, the polisher said that the vibration from the old wheels caused such lameness in his arms that he was used up by 2 o'clock in the afternoon. The new wheels, having no vibration, enabled him to work with less fatigue, and he could enjoy his evenings with his family.

Good dust-collecting systems should be installed in order that the dust from the wheels may be quickly removed. Abrasives will fly from the wheels; and if the grains from the coarse wheels come in contact with work undergoing finer operations, deep scratches will be caused which oftentimes the operator cannot account for.

Solving Variable-Speed Problem

Another question of considerable importance in polishing machines is that of variable speeds. All buffing wheels, and a great many polishing wheels, wear down in diameter. They operate, therefore, in a constantly reduced efficiency, due to decreased surface speeds. Direct current, permitting the use of variable-speed motors, is found in only a few localities, and to transform alternating current to direct current has been found to be too expensive. The best answer to this variable-speed question seems to be the machine with the electric motor built into, or attached to, the column of the machine and belted to the wheel shaft. This type of machine is rapidly replacing all others where variable speeds are necessary.

Automatic polishing is rapidly taking its place in the industry for processing large productions of flat pieces, or pieces having a portion of their surfaces flat such, for instance, as the flat parts of pliers, or such articles as plane blades, flat-irons, wrenches, sheet metals, strip steel, flat bars and knife blades. Round bars, tubes, and contoured pieces are also being successfully produced on automatic machines. The variety of work capable of accomplishment by automatic process is rapidly increasing.

Like all other tools, there is one best polishing wheel for every operation, but the fact that they are tools of very considerable importance has been somewhat lost sight of. In the manufacture of polishing wheels, too much consideration has been paid to something to sell at a competitive price rather than to the development of the tool itself in the proper relationship to the work it is to do.

Function of the Wheel

The function of the wheel is to act as an agent for carrying the abrasive, and to provide the cushion so that the wheel may execute its cutting function. The wheel should be perfectly round and true in order that the entire surface may be cutting at every revolution. A wheel which has high spots on it, or is uneven on the face, will present only a part of the abrasive head to do the cutting, with the result that the operator has to employ more time to reduce a given amount of metal.

The abrasive grain, which does the actual cutting, is one of the two most important prerequisites of polishing. Glue is the most important, and the grain is secondary only because the grain cannot be given a chance to do its best work unless firmly bonded to the wheels by the glue.

There are two kinds of abrasive grains in common use —emery, which is a natural product, and grains which are manufactured from bauxite. A great many concerns have been unable to secure as satisfactory results with manufactured abrasives as with the natural emery. The difficulty was not due to the grain itself, but entirely to the use of inferior glue, or to improper glue handling equipment and methods. The manufactured grains are harder than emery, and, therefore, require a stronger bond. Care must be used to see that the proper sizes of grains are used in the proper sequence from the coarser to the finer operations.

Attention to the Glue

Glue is the most important prerequisite of polishing. When it is realized that the abrasives glued to polishing wheels have to perform the same operation of grinding away or tearing down metals as solid vitrified wheels do, it will be evident that glue as the bond between the wheels and the abrasives is the most important factor in polishing. The efficiency of the combination of the wheel and abrasive as the cutting tool depends almost entirely upon the strength of the glue bond. The ability to secure the desired finished surface, and the cost of securing that surface, depend upon the strength of the glue bond. The author gives numerous examples to illustrate the characteristics and uses of wheels, abrasives and glue.

As to the supervision and standardization of the polishing department, it is to the advantage of executives and engineers that they analyze their polishing problems; that they do not try to correct conditions by remedying the weak spots, but by making a complete and fundamental analysis as a basis for a systematic control and standardization.

Put away a certain amount of your earnings each year for new equipment and you will be in a better position to meet competition with a smile.

Storage and Repairs at a Cuban Sugar Central

By Frank C. Hudson

SUGAR mill repairs involve all sorts of machine work and there is no thought of monotony either for the foreman or the mechanics. The sugar mill at Hershey, Cuba, where sugar is made for the Hershey chocolates, is unusually well equipped for repair work and has a number of modern machine tools. In addition, it has a good system of storing spare parts.

One corner of the spare-parts storage is shown in Fig. 1. Instead of being piled together in heaps that effectually hide the contents and make it difficult to get at the part wanted, there are comparatively small raised platforms, substantial enough to support heavy weights, and with room to allow free passage between them. In this way it is easily possible to not only see whatever is stored there but to get at it with a minimum of labor and time.

Just across the road are the scrap bins for various materials, which are carefully sorted and kept separate. The unique feature of these bins is that they are made from old boiler flues, supported at the ends and centers by larger flues, having suitable slots cut in them with a gas torch. The large tubes are driven into the ground and form excellent supports for the smaller tubes that form the bins.

Just as examples of the kinds of jobs that are liable to come in at any time, two illustrations are given. Fig. 3 shows a low-pressure piston that let go at the most inop-

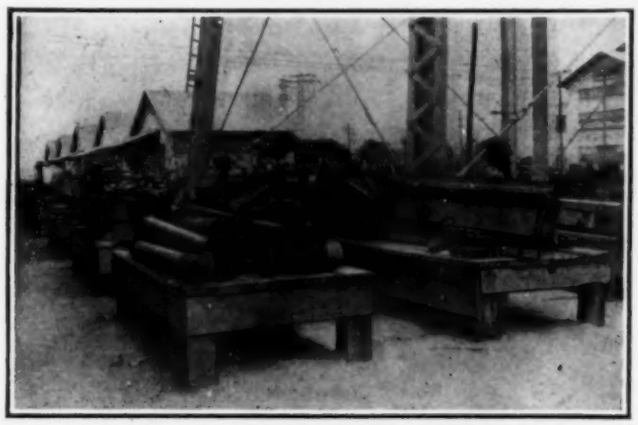


Fig. 1—Storage platforms for spare parts

Fig. 2—Scrap bins made of old boiler tubes

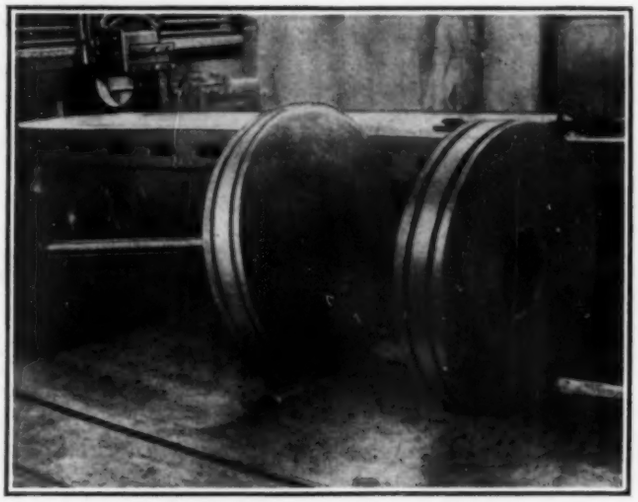


Fig. 3—Low-pressure piston repair job

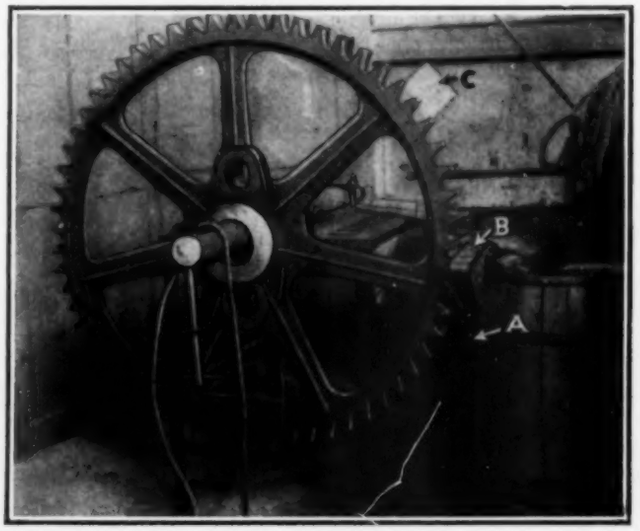


Fig. 4—Building up teeth in worn gear

portune time, in the midst of the grinding season. As can be seen, the center pulled out completely, making a new piston the only satisfactory way of putting it in commission again. The new piston is just behind it, with the rod in place.

Another emergency job is shown in Fig. 4, being a very important gear, otherwise the task of building up all the teeth would not have been undertaken. The extent of the wear can be seen on the teeth below the welding block. An upright *A* supports the block of refractory material *B* while the welding is under way, the teeth being built up by use of the electric arc. The templet *C* shows how the work is gaged as the welding proceeds.

There is also a small foundry connected with the machine shop, in which emergency castings are made. The traveling crane in the foundry is driven by two small air motors, but the hoist is a hand-operated chain block of approved design.

"Before we painted the aisle lines on the floor a lot of our shop injuries were caused by falling over material that was out of place. The aisle lines have almost eliminated them." This in a shop of perhaps a hundred men. And the aisle lines here are yellow instead of white. "Seem to look better for a longer period than white."

THE · FOREMAN'S · ROUND · TABLE

Receiving the New Man in the Shop

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"LOOKS like you'd been taking lessons in 'How to Behave in Polite Society,' and were practicing on the new man, Al. What's the big idea?"

"Well, I'll tell you, Ed. I've been thinking about something I read on handling new men, and I'm trying it out. I figure it will save a lot of time, some spoiled work, maybe, and also save a lot of gossip."

"I don't get you. Don't see how 'Meet Mr. Jones, Mr. Brown,' gets you anywhere. They'll find out about each other soon enough. Too soon sometimes."

"We'll see, Ed. But I'm beginning to believe it's a lot better to indulge in a few preliminaries. So I introduced the new man, Harvey, to the rest of the boys. I also told 'em where he came from, and the kind of work he'd been doing. I figure it will save some time and help both ways. The new man ought to feel somewhat less strange, and the older men will know something of what to expect from Harvey."

"Don't believe it will make a particle of difference. When I get a new man I pick out a fairly hard job, give him the blueprint and the tools, and let him go to it. If he's any good he'll find a way to do it, and if he isn't I want to know it quick. Don't believe in coddling 'em."

"You're all off, Ed. Perhaps that's why a new man always sets back production and piles up the scrap 'till he learns how to do the job. Letting a man work out his own solution is mighty expensive in most shops.

"No. I try to spend a lot of time with a new man unless I know he's handled our kind of work before. I give him all the pointers I can before he starts. I point out the parts to watch closely. And I tell why certain parts have to be more accurate than others. Then I keep close tabs on him the first day."

"That's a good way to make 'em nervous, and I've found it helped 'em make a lot of mistakes. So I let 'em alone."

"Seems to me, Ed, that a lot depends on how you talk to them. I think a foreman ought to try to make them feel that he's taking a real interest in their making good."

"Sort of kid 'em along, eh, Al?"

"Not a bit of it, Ed. I mean it. If they don't make good it reflects on me. The better work they do the better showing I make in the department."

Do you agree with Al's plan of making a new man feel at home?
Or is Ed's way of putting them all on their own, the best?
How much supervision should the new man have?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Saving Money with a New Machine

THE appreciation of most things in life is a function of the cost of them—either in dollars and cents or in the sacrifice of something else to attain them. Similarly, it is hard for the shop men to be keenly interested in a new machine if they do not know the facts about the cost of it. Without this knowledge, it is just a mere routine matter to them. Having made the cost of a new machine a matter of popular knowledge, it is only logical to follow this up with the facts on which this investment was made. It should be borne in mind that a machine should not be bought in anticipation of obtaining the maximum production which the machine salesman will quote, as an average production for all shops, conditions and operators. Rather the necessary output should be calculated on actual local conditions, and in this way a practical standard can be set. This standard, when published, will be within the attainment of the men. If the standard is carelessly set at the absolute maximum, it may have a bad effect, in that the men will ridicule the standard as being impracticable and impossible to attain in that factory. Learning more about the job higher up is of help to everyone no matter what his station is in life. Work directed with a full knowledge of all the ramifications of the business is bound to be more intelligently directed and successfully completed than if the foreman merely knew the means usually employed, but didn't know the end to be attained. A knowledge of the costs will give him an appreciation of this vital end of the business.

—WILLIAM V. HOAGLAND.

Solving the Vacation Problem

IT IS better to offer a bonus in the form of a brief vacation for perfect attendance and punctuality, than to deduct from employees' pay envelopes for perhaps slight tardiness. Any award, however minor, is sure to be appreciated by the worthwhile employee, and there is an incentive, inasmuch as he has something to look forward to. A short vacation period will benefit any worker, and it cannot be viewed as possible loss for the machine shop. The well-managed plant, in any case should be able to take care of this vacation question. Docking employees often causes sulkiness among the men, it discourages, and this is particularly true when some expert employee is charged for a few minutes' lateness simply because the shop, in its endeavor to carry out to the letter its strict policy, docks this man, although he may rarely come late. The shop award for punctuality and attendance inspires goodwill and better workmanship; a short vacation is good for the employee, and altogether the shop morale is improved, promising better output and quality. Awards, it must be borne in mind, are positive; the deduction is negative, and for that reason the latter commands little consideration. A vacation award should be a good thing for the shop.

—FRANK V. FAULHABER.

TARDINESS is a costly annoyance, not only because of the direct tie-up of the machines and material for the period of time involved, but also because of its indirect consequences. Where tardiness exists, there are always bound to be certain workmen who are leaders in being late. The other men soon recognize them, and as soon as the whistle blows, they check up on them. Time is lost speculating as to when they'll show up, and what the alibi will be this time. When they come in finally, everybody looks up, whistles, or calls out a greeting. Right there, the total time lost is many fold greater than that lost directly through the individual offender. In addition, the foreman feels that he has to "bawl out" occasionally the more flagrant offenders, a procedure which he does not enjoy, and which does not help his own producing efficiency. Docking is not a solution. The man who won't take his responsibility to the firm sufficiently to avoid habitual lateness will hardly take it to himself in a more serious light; for after all, docking is only irritating to this type of man. But, a vacation is something different. He, of all people, will think most of it. It is a real year-round incentive for him, in which he has everything to gain. I believe that a vacation dependent upon attendance would be a good solution. Vacations for the shop are practical in this day and age. The shop man is influenced by the same factors as the office man; and, since it has been admittedly good for the office man without question for years, it should be equally good for the shop man.

—FREDERICK D. JEWETT.

THE problem of giving shopmen vacations with pay is very well solved by offering a time bonus for regular attendance. There is no single factor which so disrupts production schedules as the mechanic who fails to show up at the very time you need him most. Try as you may, he still feels that since he's docked for his absence, the management hasn't any kick coming when he takes an unexpected day off. The fact that the management has its investment in machines and materials idle for the day, as well as its reputation for delivery dates at stake, never will penetrate.

THE · NEXT · TOPIC

Receiving Personal Mail in the Shop

ADVANCE QUESTION

Assuming that it is impractical to prevent a certain amount of personal mail being directed to the workmen in the shop, what is the best way to handle it?

So, with the continued spread of the vacation idea, it's good policy to "kill two birds with one stone." Fundamentally, that which is earned is always more appreciated than something for nothing. With his vacation dependent upon the regularity of his attendance, the shopman hesitates about responding to that urge to take a day off. A good plan is to give one day's vacation for every month of perfect attendance—neither absence nor lateness. This gives the man who has fallen down one month a chance to redeem himself and his vacation in the succeeding months. Bona fide illness, as evidenced by a doctor's certificate, should not be penalized by having it subtract from a man's vacation.

—JOHN W. GARDINER.

Looking Beyond the Department

THE active executive takes a walk through the shop occasionally to see what he can criticize and is interested both in things right and wrong. He doesn't mention the things that are right because that is the way they should be, but he will mention the things that are wrong so that they can be corrected. There is a good deal of psychology in this fault-finding trip, because every time he finds something that can be corrected it will increase the foreman's regard for him as it shows the "Big Boss" knows one or two things himself.

A foreman should be interested in every way as concerns the cost, design, and manufacture of the product. He is paid to help produce a quality product, and it is up to him to help even to the selling of the finished product as his job depends on a steady demand for the article.

—BENJ. C. THOMAS.

Using Makeshift Tools

"HELLO, Joe! Say I heard Ed and Williams in an argument this morning over in the machine shop! It seems that Williams had wanted to buy a new milling machine for that new pump-body job, and that Ed had one of his money-saving spells on and talked the boss into letting him fix up an old drill press to do the job. Well, they got her fixed up and started on the job yesterday morning after some little delay due to going over the old machine and making two special cutter heads. You see, Joe, it was really a milling job, but Ed thought he could finish the gasket surface with a scraping cut on the old drill press, and I guess it worked until they went to crowding it a little to get the production up to compare with the estimate of what the milling machine would do, and there is where the trouble started. The cutter hogged in and twisted the table around and snapped the old drill spindle off at the thrust bearing.

"Well, the worst of it is, they wired for a new spindle, and found that there's none in stock, and that one would have to be made up, which would delay the job for another ten days. Al told me the details afterwards, and said that Williams had wired the machinery house to ship the miller by express."

"Well, I'll tell you what I think about it, Pete. Ed's got a lot of good ideas that save the company money, but just because he falls down on a job, you fellows want to give him a black eye."

"No, Joe. You've got me all wrong. I know Ed's got a lot of good ideas. I am just telling you the story. I will say this, though, that when Williams offers me any new equipment for the blacksmith shop, I am not going to say 'no,' and that I will fudge up my old machines and get by.

—A. W. FREEMAN, *Superintendent.*

Refusing to Be a Doormat

A LOOK at an unabridged dictionary gives the impression that it contains words enough so that none needs to have more than one meaning. However, more careful study shows that many common words have several different and unrelated meanings. Then there are many of us who coin new meanings all our own. I worked for one man four years before I discovered that when I told him that I was discouraged, he thought I meant that I was entirely beaten.

All this because I very much suspect that a large proportion of the cases where men think they have been treated as doormats, if investigated, would show a misunderstanding. If not, it seems to me that it is justifiable for the doormat worm to turn. Of course, it is a matter of safety for the worm to look around a bit and see if he has not invited someone to step on him.

—ENTROPY.

I DON'T believe Osborne was at all wise in letting the master mechanic get away with unjust accusations. While there was probably nothing to be gained in continuing the discussion while both were excited and "het up" about it, Osborne should have come back at the master mechanic when they had cooled off later in the day; and I feel certain, that under such circumstances, the master mechanic would have seen the injustice of his stand in the morning, and made amends accordingly.

Unreasonable acts can best be taken up through the medium of the personnel manager. He is the logical man in the organization for making a fair and impartial investigation; and if the complaint proves well grounded, he can pass it higher up for action.

—KARL NIXON.

PROBABLY every executive at some time or other carries a grouch which he has developed elsewhere, and which he expends on the foreman. The foreman should be sufficiently keen to recognize these human failings, and when they are few and far between, he should be big enough to overlook them. They are usually followed immediately after by a period of repentance, for the executive himself soon realizes the unreasonableness of his attitude, and attempts to make amends by being particularly considerate of the foreman's viewpoints on his next contact with him.

For the executive who has deliberately set out to ride a foreman as an indication of his authority and executive ability, there is only one thing for the foreman to do—call a showdown. Quietly and frankly he should ask to have the matter referred higher where he can present his own case himself. He should take a firm but reasonable attitude, and avoid any indication of belligerency or stubborness. The executive who has adopted the "doormat" attitude will more than likely reveal it in his presentation of the case, and the foreman will profit by whatever dignity he can summon to aid him in presenting his.

—STANLEY J. GUSTOF.

Ideas from Practical Men

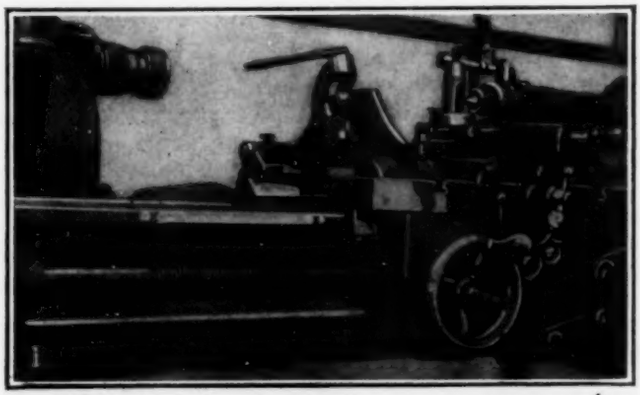
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from a minimum of five dollars upwards, depending upon their merit

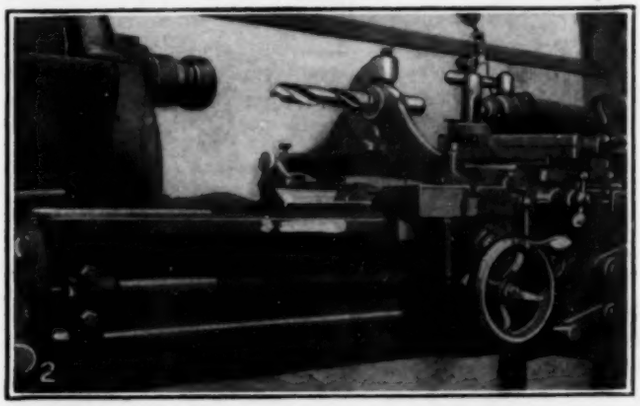
A Tool-Holding Attachment for a Lathe

By Edwin Kilburn

The illustrations show an attachment we recently developed to expedite centering, drilling and boring operations without interfering with the regular cross-feed.

The device mounted on the lathe carriage, with the tool clamp unlocked to receive any suitable tool, is shown in Fig. 1. In Fig. 2 it is shown with the tool clamp closed and with a Morse taper socket, carrying a twist drill, locked in position.





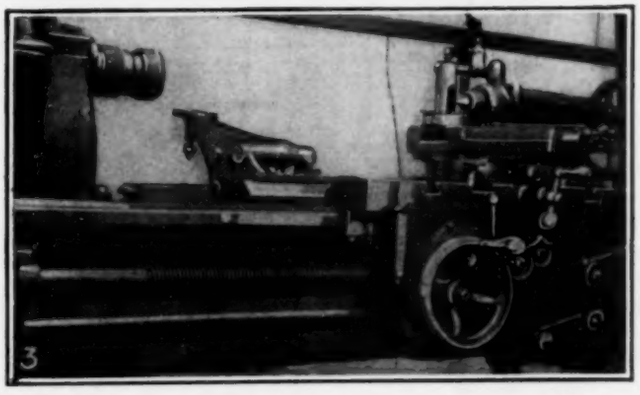


Fig. 1—The attachment in place. Fig. 2—Holding a drill. Fig. 3—Bridge swung back

The tool clamp is bored to 1½ in. and will accommodate bars of that size or smaller, suitable sleeves being used with smaller bars. Since the bore of the tool clamp is in alignment with the center line of the lathe, tools may be removed and replaced without change of alignment. This latter feature is very useful when boring to close limits, since the bar can be removed for measuring and replaced whenever necessary. A bronze bearing is fitted to the taper hole in the headstock spindle and is used as a pilot bearing for the boring bars.

In Fig. 3 the bridge is shown unlocked from the T-slot on the front side of the carriage, and swung back out of the way to permit the use of the regular cross-slide toolpost. Figs. 1 and 2 show a thumbscrew on the back of the bridge. The thumbscrew is used to retain in place the hinge pin that secures the bridge to the bracket at the back of the carriage. Releasing the thumbscrew and removing the hinge pin is all that is necessary to remove the bridge from the lathe. The bearing piece to which the bridge is attached may be removed by releasing the bolts that secure it to the carriage. Dowel pins are fitted to make certain that the bearing piece will always be located in the same position if removed from the carriage for full-swing faceplate work.

This entire attachment was built up of steel by torch welding and has proved very satisfactory in every-day service.

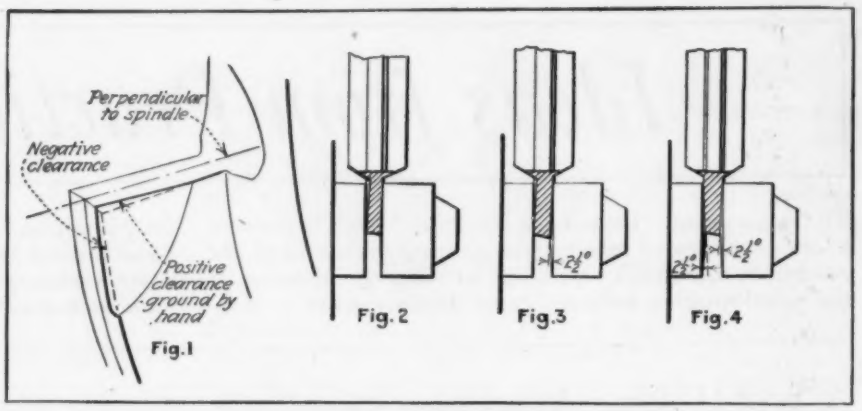
Positive Clearance for Circular Cut-off Tools

By Henry Simon

It is sometimes difficult to obtain a good finish on the cut-off when the tool has the usual negative clearance. For this reason operators sometimes prefer to grind their own clearance in by hand, as shown in Figs. 1 and 2. When properly done, this results in a good finish, but it is plain that it is a wasteful process, since a considerable portion of the tool is spoiled at each grinding.

Though operators are not usually able to explain the exact character and action of the edge they grind, what is actually accomplished is to form a small positive rake in the edge, as shown in the drawing, with a clearance below, a shaving cut being thus produced. Sometimes the angle of clearance is very small and therefore not noticeable in the tool, but it is always there, as will be seen by placing the end of the product against a straight-edge.

Some years ago I decided to see if it were not possible to obtain the same result by turning the cut-off tool with a small, positive clearance-angle. It was at first considered doubtful if this would succeed, since it was argued that a small enough angle would create practically no clearance directly under the cutting edge, and therefore, rubbing and heating of the tool would ensue. Experiments with several tools having various angles, however, proved that an angle of $2\frac{1}{2}$ deg., as shown in Fig. 3, gave the desired result, the parts having a high finish on the cut-off. The tool stood up well, proving that the clearance between the product and the tool was sufficient. A double angle of $2\frac{1}{2}$ deg., as shown at Fig. 4, was also tried, and was found to work well in many instances, though the tool seemed to have a tendency to cause a heavy cut-off burr to form at times. Nevertheless, in cases where the cut-off was deep, and the resulting large-end surface had to be well finished, this disadvantage was much more than offset by the good finish obtained and by the long life of the tool between grindings.



Clearances in cut-off tools

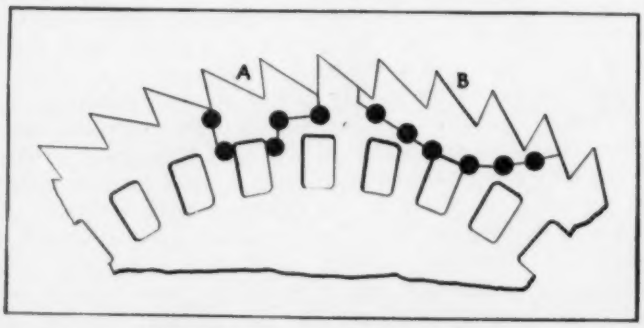
To make tools of this kind a success, a smoothly-formed and highly finished surface on the sides of the cut-off flange is the main consideration and makes all the difference between success and failure. Carbon tools of this kind should be honed with a whetstone and oil after hardening. It is best to use high-speed tools only, ground and polished, for steel parts. It is also advisable to have the point of the cut-off tool with a single angle, instead of with a straight portion adjoined by an angle, because this leaves a stronger teat and one that is less liable to break off from the bar and remain on the product.

There are some cases where it will not be possible to use a positive rake of this kind, but it can be used successfully in a large percentage of cases, as is evidenced by hundreds of thousands of parts of various kinds, in both steel and brass, made under my supervision, where a better finish as well as greatly increased life of the tools resulted.

Repairing Broken Cold Saws

By Charles F. Landrie

In the shop where I am employed we have a cutting-off machine in which semi high-speed saws are used. The saws are 14 in. in diameter, $\frac{5}{32}$ in. in thickness; and have 80 teeth. There are 30 oblong holes near the periphery, in which the driving pinion meshes.



How the saws were repaired

Occasionally saws are broken and we have been in the habit of throwing them into the scrap pile, because we knew of no way to repair them. Recently we installed a spot welding machine and I decided to see what could be done in the way of repairing the saws by spot welding.

Two saws were selected. One was broken as at *A* in the sketch, and the other one was broken as at *B*. The edges of the breaks were ground square. Pieces from other broken saws were cut to match the breaks, the cutting being done by a rubber-bond wheel $\frac{1}{16}$ in. thick. The pieces were then ground to a close fit in the breaks and were spot welded in place, as indicated by the black dots in the sketch. At each spot the metal at the edges was fused, sticking both parts together.

One of the repaired saws has been in use for about two weeks, cutting all sorts of metal, including tool steel, and has shown no signs of breaking. Since considerable money can be saved by repairing saws in the manner described, I am passing the idea along.

Solid Collets for Grinding—Discussion

By W. H. Rhodes

Preston, England

Bushings held in the collet described by Henry C. Francis, on page 703, Vol. 66 of the *American Machinist*, will not be either round or concentric.

The correct method of producing bushings, where extreme accuracy is required, is first to grind the end faces parallel to provide accurate faces for succeeding operations. For grinding the outside diameters, the bushings should be held by the ends, using a mandrel such as shown in Fig. 1. It will be seen that there is no contact between the bore of the bushing and the mandrel, and that the hold is by pinching the bushing endwise between the washer and the shoulder on the mandrel. When the bushing is mounted on the mandrel, the nut should be screwed up lightly by the fingers. The bushing should be trued up

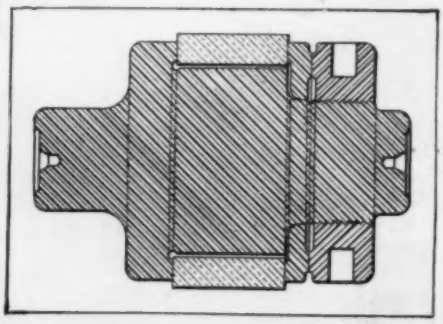


Fig. 1—Mandrel for grinding bushings on the outside

by tapping it and testing it with an indicator. When it runs true, the nut can be screwed up tightly.

After the outer diameter has been ground, the bushing should be removed from the mandrel and placed in a chuck such as is shown in Fig. 2. Here it is held in the same manner as in the previous operation, with the exception that the body is a light, push fit in the ground hole in the chuck. Since the clamping is by end pressure only, there will be no distortion in the direction of the diameter. When so held, after the bore of the bushing has been ground, the internal and external diameters will be parallel and concentric within very close limits.

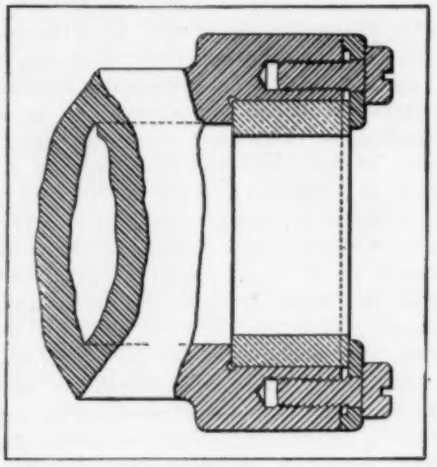


Fig. 2—Chuck for grinding bores of bushings

Where bushings are to be ground in quantities, the hole in the chuck would wear from the continued insertion and removal of the work, and new chucks would have to be made at intervals. In such cases a chuck in which compensation for wear can be made, should be used. A very good chuck of this kind is illustrated in Fig. 3. Its components are the body *A*, the chuck ring *B*, the collet *C* (split in one place only), the hardened ring *D*, the cap *E* and the locknut *H*.

In assembling the chuck, the hardened ring *D* is pressed into the body and the end is ground true. After the split collet has been put in, the chuck ring *B* is screwed on until the back of the collet strikes the projecting ring *J* on the body. A small key, fitted to the split in the collet, is put in and the chuck ring is screwed up until the collet is compressed enough to hold the key tightly. Then the hole in the collet is ground for a light push fit for the bushings to be ground. The threads on the chuck ring and in the cap are interrupted so that a part of a turn only will be required to hold the bushings for grinding. Wear caused by the continual insertion and removal of bushings, can be compensated for by compressing and regrinding the collet. In doing this, the key should be taken out and reduced slightly in width. The cap is knurled to provide a grip for the fingers, although holes are provided for a spanner wrench. Such chucks are used for grinding rings for ball and roller bearings.

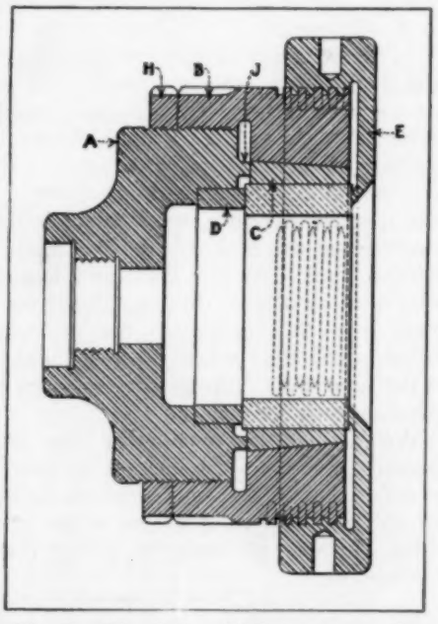


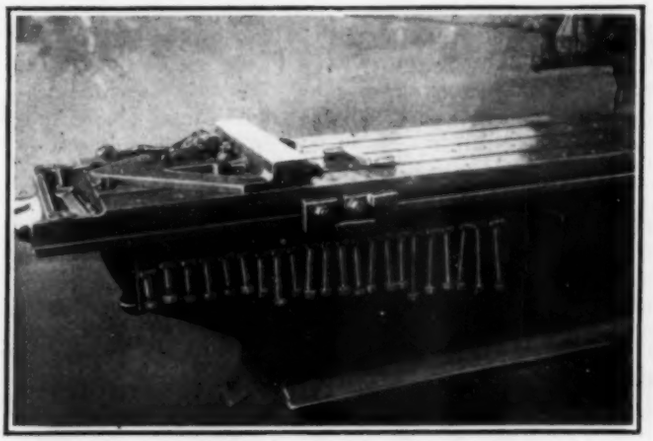
Fig. 3—Chuck in which compensation for wear is provided

A Handy Place for Planer Bolts

By Milton Wright

One of the minor exasperations that go to make up the average planer-hand's daily burden of toil, is the difficulty of finding enough T-head bolts that are not just a little too short to give a safe hold or are quite a bit too long so that they will stick up above the work, to the annoyance and perhaps danger of the workman.

To avoid trouble of this kind it is first necessary to have bolts enough and in sufficient assortments of length to accommodate any job that is likely to come along.



Handy rack for planer bolts

Second, and hardly less important, is to have them where they can be found readily when wanted. The illustrations show how this condition may be met.

A strip of hard wood is attached to the side of the planer bed, under the overhang of the platen, by flat-head machine screws tapped into the casting. Headless nails are then driven in pairs into the strip, the members of each pair just the right distance apart to take the body of a bolt between them. Any reasonable number of bolts may be accommodated in this way, and if the workman will cultivate the habit of returning each bolt to its alloted place when taking it from a job he can, when setting up a new job, reach for and find a bolt of the right length for each place.

Preparing Iron and Steel for Painting

By E. LeMartin

So much has been said and written concerning general and engineering methods in structural and ornamental iron and steel work, that, perhaps minor details have been forced into the background. This applies especially to painting. It will be noted that in structural iron and steel, such as is used in factory and bridge work, the surface is somewhat glazed. The glazing is caused by the rolls in the mills and by borax used in the process of rolling.

When work having such a surface is painted, the paint will peel off in spots after a time, and the metal will

become rusted. Paint sticks well to a rusted surface, owing to the minute pits that hold the paint. However, to repaint work that has peeled in spots is expensive and looks patchy. Considerable time and money can be saved by applying, with a brush or a spraying machine, a solution of chemicals that will remove the glaze from new work and leave a light coating of rust, before painting. This is also true in regard to contractors' equipment that is exposed to the elements. Machinery castings also can be treated by this method to remove the graphite that is used to dust the molds in the foundry, some of which clings to them after the sand has been removed.

Sack Holder Eliminates Double Handling of Shells

By Louis L. Locke

Two separate handlings of work requiring shipment in sacks is condensed to one handling by the sack holder shown in the illustration. Prior to the use of the device, the work was transported after completion to the shipping department, where it was counted and placed into sacks. The entire operation now is handled at the press in which the final operation is done.

When an order for a given quantity of pieces is received, the operator obtains an empty sack and attaches it to the sack holder as shown. As the completed shells are turned out, the operator throws them into the sack. Observation is made of the reading of the counter attached to the machine, so that when a stipulated quantity has been completed, the sack is sent to the shipping department with the original order, so that the only remaining duty to be performed, is the sealing of the sack and the attaching of a shipping tag.

Sack holder that simplifies shipping duties

The sack holder is made of two side frames that support an upper band to which the sack is attached. The open end of the sack is placed over pin hooks located on the sides of the band, so that it will not fall off while being loaded.

Disk Grinding in a Cuban Shop —Discussion

By Elton Sterrett

In an article by Henry C. Francis, under the title given above, on page 1100, Vol. 66, of the *American Machinist*, Mr. Francis does not specify the direction of rotation of the disk grinder. If, as is customary, the direction is clockwise, two drawbacks appear in practice: The work, under the urge of the abrasive disk, tends to crowd up into the narrow end of the plate openings and to be ground unevenly; or, if the iron does not bottom in the point, the heel of the iron—which must be square to do good work—is worn away more rapidly than the remainder of the base, and irregular work results.

Some years ago, it fell to me to plan the equipment for a small foundry that sought an easily-finished product to carry through production in connection with its jobbing trade. One of the lines selected was "sad" irons, and disk grinders were installed to do the small amount of finishing required. Plates such as Mr. Francis described were used, but to economize on space and get more irons on the grinder at one charge, the slots were cut with the points inward. That is, with the longer axes of the irons arranged radially. With this change we got seven irons to a disk, whereas Mr. Francis has but five.

We soon learned, however, that the two corners of the heel and the sharp point of the iron wore away the disk more rapidly than the body of the iron, and that the work was anything but dead flat when turned out. That suggested facing the irons so that they would meet the abrasive "point on," which we found gave the point the slight amount of clearance necessary to insure ease of ironing. Likewise, with the thrust of grinding taken against the heel of the iron, a smoother finish resulted. Instead of the arrangement shown by Mr. Francis, we found more even grinding resulted when the point and the center of the heel were equidistant from the center of the grinder, reducing somewhat the amount of the disk covered, but compensating for this by the improved finish obtained.

A further improvement trebled the life of the disk and at the same time did away with any possibility of the work tending to groove—as often happened with a rigid rig such as Mr. Francis illustrates. We slotted one side of the plate radially so that it would easily work over an upright roller in the grinder frame, and on the side directly opposite, we fitted a bushing enclosing an eccentric on the end of a vertical shaft driven from the grinder shaft. As this shaft and eccentric revolved, the plate was oscillated, carrying the irons slowly back and forth over the surface of the grinding disk, giving a better polish than when the plate was rigidly held, and at the same time cutting three minutes from the average grinding time, per charge.

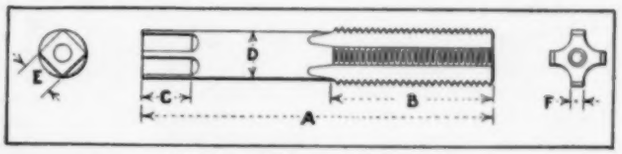
We found that oscillating the irons while being ground, gave them the burnish so dear to washerwomen in a fraction of the time required to build up the glaze on an iron held in one spot while grinding—and thus aided the sale of irons by giving them a distinct advantage.

Chip clearance in the design of tools is important. Design tools with proper cleaning facilities and the work produced will be more accurate.

Standard Tap Dimensions

The specifications for standard taps were arrived at through experiment and co-operation with tap manufacturers by a sub-committee of the Works Managers' Committee of the General Motors Corporation and approved Feb. 18, 1927. They were later submitted to the Society of Automotive Engineers, and to the tap manufacturers, and approved by them. They represent the first tap standards ever fully agreed upon, and as soon as present stocks are exhausted, these specifications will apply to all taps. It was recognized by the committee that unusual cases will arise where special taps may be required, but the standards adopted are expected to fit all ordinary requirements under normal shop conditions.

(Continued on sheet 12a)



Standard Hand Plug Tap

Dimensions for Hand Plug Taps with Cut Threads

Size	Pitch Diameter Basic	Pitch Diameter Min.	Pitch Diameter Max.	Major Diameter Basic	Major Diameter Min.	Major Diameter Max.	General Dimensions: Overall Length A	Thread Length B	Square Length C	Shank Dia. D	Square Size E	Land Width F
1/4–20	.2175	.2180	.2200	.2500	.2525	.2550	2 1/4	1	3/16	.255	.191	.065
1/4–28	.2268	.2273	.2288	.2500	.2525	.2550	2 1/4	1	3/16	.255	.191	.065
5/16–18	.2764	.2769	.2789	.3125	.3155	.3180	2 1/16	1 1/16	3/16	.318	.238	.081
5/16–24	.2854	.2859	.2874	.3125	.3155	.3180	2 1/16	1 1/16	3/16	.318	.238	.081
3/8–16	.3344	.3349	.3369	.3750	.3785	.3810	2 1/16	1 1/16	1/4	.275	.206	.097
3/8–24	.3479	.3484	.3499	.3750	.3785	.3810	2 1/16	1 1/16	1/4	.275	.206	.097
3/8–16	.3344	.3349	.3369	.3750	.3785	.3810	2 1/16	1 1/16	1/4	.381	.286	.097
3/8–24	.3479	.3484	.3499	.3750	.3785	.3810	2 1/16	1 1/16	1/4	.381	.286	.097
7/16–14	.3911	.3916	.3941	.4375	.4410	.4440	3 1/16	1 1/16	5/16	.323	.242	.114
7/16–20	.4050	.4055	.4075	.4375	.4410	.4440	3 1/16	1 1/16	5/16	.323	.242	.114
1/2–13	.4500	.4505	.4530	.5000	.5040	.5070	3 1/16	1 1/16	5/16	.367	.275	.130
1/2–20	.4675	.4680	.4700	.5000	.5040	.5070	3 1/16	1 1/16	5/16	.367	.275	.130
9/16–12	.5084	.5089	.5114	.5625	.5670	.5700	3 1/16	1 1/16	3/8	.429	.322	.146
9/16–18	.5264	.5269	.5289	.5625	.5670	.5700	3 1/16	1 1/16	3/8	.429	.322	.146
5/8–11	.5660	.5665	.5690	.6250	.6300	.6330	3 1/16	1 1/16	7/16	.480	.360	.162
5/8–18	.5889	.5894	.5914	.6250	.6300	.6330	3 1/16	1 1/16	7/16	.480	.360	.162
3/4–10	.6850	.6855	.6885	.7500	.7550	.7590	4 1/16	2	1/2	.590	.442	.194
3/4–16	.7094	.7099	.7124	.7500	.7550	.7590	4 1/16	2	1/2	.590	.442	.194
7/8– 9	.8028	.8038	.8068	.8750	.8805	.8845	4 1/16	2 3/16	5/8	.697	.523	.212
7/8–14	.8286	.8296	.8321	.8750	.8805	.8845	4 1/16	2 3/16	5/8	.697	.523	.212
1 – 8	.9188	.9198	.9228	1.0000	1.0060	1.0100	5 1/16	2 1/16	11/16	.800	.600	.242
1 –14	.9536	.9546	.9571	1.0000	1.0060	1.0100	5 1/16	2 1/16	11/16	.800	.600	.242
1 1/8 – 7	1.0322	1.0332	1.0367	1.1250	1.1310	1.1355	5 3/16	2 3/16	3/4	.896	.672	
1 1/8 –12	1.0709	1.0719	1.0749	1.1250	1.1310	1.1355	5 3/16	2 3/16	3/4	.896	.672	
1 1/4 – 7	1.1572	1.1582	1.1617	1.2500	1.2565	1.2610	5 1/16	2 3/16	1	1.021	.766	
1 1/4 –12	1.1959	1.1969	1.1999	1.2500	1.2565	1.2610	5 1/16	2 3/16	1	1.021	.766	
1 1/2 – 6	1.3917	1.3927	1.3962	1.5000	1.5075	1.5120	6 1/16	3	1 1/4	1.233	.925	
1 1/2 –12	1.4459	1.4469	1.4499	1.5000	1.5075	1.5120	6 1/16	3	1 1/4	1.233	.925	

Dimensions for Hand Plug Taps with Ground Threads

Size	Pitch Diameter Basic	Pitch Diameter Min.	Pitch Diameter Max.	Major Diameter Basic	Major Diameter Min.	Major Diameter Max.	General Dimensions: Overall Length A	Thread Length B	Square Length C	Shank Dia. D	Square Size E	Land Width F
1/4 –20	.2175	.2180	.2185	.2500	.2535	.2550	2 1/4	1	3/16	.255	.191	.065
1/4 –28	.2268	.2273	.2278	.2500	.2520	.2535	2 1/4	1	3/16	.255	.191	.065
5/16–18	.2764	.2769	.2774	.3125	.3165	.3180	2 1/16	1 1/16	3/16	.318	.238	.081
5/16–24	.2854	.2859	.2864	.3125	.3150	.3165	2 1/16	1 1/16	3/16	.318	.238	.081
3/8 –16	.3344	.3349	.3354	.3750	.3795	.3810	2 1/16	1 1/16	1/4	.275	.206	.097
3/8 –24	.3479	.3484	.3489	.3750	.3775	.3790	2 1/16	1 1/16	1/4	.275	.206	.097
3/8 –16	.3344	.3349	.3354	.3750	.3795	.3810	2 1/16	1 1/16	1/4	.381	.286	.097
3/8 –24	.3479	.3484	.3489	.3750	.3775	.3790	2 1/16	1 1/16	1/4	.381	.286	.097
7/16–14	.3911	.3916	.3921	.4375	.4425	.4440	3 1/16	1 1/16	5/16	.323	.242	.114
7/16–20	.4050	.4055	.4060	.4375	.4410	.4425	3 1/16	1 1/16	5/16	.323	.242	.114
1/2 –13	.4500	.4505	.4510	.5000	.5055	.5070	3 1/16	1 1/16	5/16	.367	.275	.130
1/2 –20	.4675	.4680	.4685	.5000	.5035	.5050	3 1/16	1 1/16	5/16	.367	.275	.130
9/16–12	.5084	.5089	.5094	.5625	.5685	.5700	3 1/16	1 1/16	3/8	.429	.322	.146
9/16–18	.5264	.5269	.5274	.5625	.5665	.5680	3 1/16	1 1/16	3/8	.429	.322	.146
5/8 –11	.5660	.5665	.5676	.6250	.6315	.6330	3 1/16	1 1/16	7/16	.480	.360	.162
5/8 –18	.5889	.5894	.5902	.6250	.6290	.6305	3 1/16	1 1/16	7/16	.480	.360	.162
3/4 –10	.6850	.6855	.6866	.7500	.7570	.7590	4 1/16	2	1/2	.590	.442	.194
3/4 –16	.7094	.7099	.7107	.7500	.7540	.7560	4 1/16	2	1/2	.590	.442	.194
7/8 – 9	.8028	.8038	.8050	.8750	.8830	.8850	4 1/16	2 3/16	5/8	.697	.523	.212
7/8 –14	.8286	.8296	.8305	.8750	.8795	.8815	4 1/16	2 3/16	5/8	.697	.523	.212
1 – 8	.9188	.9198	.9212	1.0000	1.0090	1.0110	5 1/16	2 1/16	11/16	.800	.600	.242
1 –14	.9536	.9546	.9555	1.0000	1.0045	1.0065	5 1/16	2 1/16	11/16	.800	.600	.242
1 1/8 – 7	1.0322	1.0332	1.0347	1.1250	1.1345	1.1370	5 3/16	2 3/16	3/4	.896	.672	
1 1/8 –12	1.0709	1.0719	1.0729	1.1250	1.1300	1.1325	5 3/16	2 3/16	3/4	.896	.672	
1 1/4 – 7	1.1572	1.1582	1.1597	1.2500	1.2595	1.2620	5 1/16	2 3/16	1	1.021	.766	
1 1/4 –12	1.1959	1.1969	1.1979	1.2500	1.2550	1.2575	5 1/16	2 3/16	1	1.021	.766	
1 1/2 – 6	1.3917	1.3927	1.3945	1.5000	1.5115	1.5140	6 1/16	3	1 1/4	1.233	.925	
1 1/2 –12	1.4459	1.4469	1.4479	1.5000	1.5050	1.5075	6 1/16	3	1 1/4	1.233	.925	

© American Machinist

Technical Abstracts

Selection of Corrosion-Resistant Alloys (Part two)

There is no one universally corrosion-resistant alloy or metal. The character of resistance to attack is dependent very largely upon the inherent chemical affinity and upon the way in which the "degree of inertness" to certain elements such as for example, oxygen, sulphur, the halogens, etc., is modified by alloying constituents.

Corrosion-resistant alloys may be divided into groups depending upon the predominating alloying metal. Hence, we have the iron-silicon alloys, iron-chromium alloys, nickel and high nickel alloys, copper alloys, the aluminum alloys, etc., each with a more or less well defined sphere of usefulness.

Given a definite corrosion problem the selection of the proper alloy is based upon the character of the conditions to be withstood, as for example, whether an acid or alkaline resistance is desired, whether conditions are oxidizing or reducing, etc. The selection having been made from the theoretical considerations, tests both in the laboratory and under actual plant working conditions should be made. An accurate estimate of the prospective life of a piece of apparatus is to compare the proposed metal with that already in service by running simultaneous tests of each under similar conditions approximating as closely as possible those in the plant.

It is important also to bear in mind that unfortunately some of the most useful corrosion-resistant alloys are extremely difficult to fabricate, and have not yet been produced in all the forms desirable. Some cannot be drawn into seamless tubing, others are cast with great difficulty, others cannot be rolled into sheets; so that in many cases the engineering ability will be taxed to design the apparatus so as to circumvent these difficulties.

Then we must remember that it is highly important that all parts of a piece of apparatus which enter into contact with a corrosion material be composed of the same metal throughout. Even small variations in the composition of the parts may be detrimental because of the electrolytic effect created. The steel and alloy manufacturers have appreciated this condition and are making all efforts to produce their respective material in all necessary forms.

The cost may seem in many cases unreasonably high, especially where the alloys are made from ordinary metals of commerce, and would appear to present no difficulty in melting or in the production of the simpler shapes. This is, however, not always so, for unusual care is necessary in handling special alloys, each one having peculiarities of its own which are mastered only after long and costly experience. Also, the scrap losses in manufacture may run very high, as is the case with the stainless chromium alloys, the scrap being of relatively little value because it can not be re-melted economically.

It is difficult to estimate in exact figures the saving effected by avoidance of shutdowns and delays unless definite information is obtainable from experience with a similar installation.—Walter M. Mitchell, *Forging, Stamping-Heat Treating*, July, 1927.

Abrasive Disks

Abrasive disks cannot be selected according to a general hard and fast rule, but carbide of silicon and manufactured alumina generally are used for grinding cast iron and steel respectively. Non-ferrous and non-metallic materials generally are ground with carbide of silicon. Garnet and emery disks are used extensively. The finish desired should govern the grain of the material.

As a rule nothing coarser than No. 16 is used to finish surfaces less than 3 sq.in. in area. Nothing coarser than 16 is used to finish steel or brass; with the possible exception of steel castings. Nothing coarser than 24 should be used on brass unless a large amount of stock is to be removed or where a fine finish is not necessary.

Number 46 is used extensively for grinding small surfaces on brass and for the finish grinding of cast iron and steel. All grain sizes from 12 to 70 are used on cast iron, the size depending upon the amount of stock to remove, the area of the work and the finish desired. In general, where the surface is more than three or four square inches in area, No. 12 or 16 will give good results.—*Abrasive Industry* for August, 1927.

Incompetent Buying of Machine Tools a Detriment to German Industry

The lack of capital is an important factor in the German machine tool building industry of today. This explains the attitude of the German machine tool purchaser who today pays more attention to the initial cost than to intrinsic quality which is not so apparent on the surface. The purchasing agents are generally lacking in engineering knowledge and too often prone to disregard the sounder judgment of experts.

A modern and rather unfair way of playing one bidder against the other is the following: Each bid is recorded by two figures—the total price of the machine and the price per pound, then the two firms which happen to be the lowest bidders in respect to these two counts are unscrupulously played against each other to the limit.

The shortsightedness of this procedure is apparent to the technical man, and the German machine tool building industry is now suffering from the effects of such a price cutting policy. Many a German firm is now building unnecessarily heavy machine tools and sacrificing the finer points of real quality, not so apparent to the layman, only to satisfy the purchasing agent's demand for a low-priced article.

Technically trained, competent purchasing agents are urged by the author, and the suggestion is made to have the manufacturer submit his product to an accuracy test under standard conditions. The accuracy of the work done and the construciton details of the machine tool should be analyzed from an engineering as well as safety and time-study standpoints. In these respects attention is called to proper lubrication of parts, circulation of coolant, the adequacy of safety devices and the convenience of operation.—G. Oehler, *Die Werkseug Maschine*, July 30.

Cadmium Plating Resists Rust

Since cadmium and zinc are similar chemically it was assumed that the electro deposition of the two would have a close resemblance, but such is not true. Furthermore, formulas which were developed in the laboratory and which apparently gave suitable deposits were not found to be satisfactory when made up in large volumes. Additional agents had to be found which would materially change the type of electro-deposited cadmium as to its micro-crystalline structure, its appearance and its hardness.

Such additional agents have been found. They change the soft white coating formerly obtained, to coats which have a high luster similar in appearance to hot dipped tin and possess a surface more resistant to rubbing. The cadmium deposited from the solution which was finally perfected is quite adherent to steel and does not lift when the steel stock is bent or twisted. It differs considerably in this respect from hot galvanized coats. The throwing power was also good and this resulted in coatings fairly even in thickness and free from pin holes.

Cadmium is now very often substituted for zinc as a protective coating because of its better qualities and its greater attractiveness. The fact that it is not attacked by caustic alkalies makes it of decided worth as a protection for steel in the washing machine industry, which is highly competitive and where a substitute for copper or nickel-zinc tubs was sought. Steel was found to be preferable because of its strength, cheapness and ability to be straightened out if dented, without any real injury, but

it could not be used without proper protection. Therefore, cadmium coats approximately 0.006 in. thick were suggested and have proved efficient. Other parts of the washing machine are now similarly protected.

In the automobile industry recognition of the value of cadmium is widespread. Among the various cadmium plated articles are bumpers, bolts and nuts, brake parts, tire rims, chains and parts of gasoline pumps coming in contact with gasoline such as guide and indicator rods.

Government specifications for airplane parts which formerly were rustproofed with zinc now state that cadmium may be used. Colonel Lindbergh's famous plane, the Spirit of St. Louis, has the hub halves, ring clamps, bolts, nuts, and clevis pins which complete the assembly of the propeller protected against rust by cadmium.

Over half a million radio loud-speakers have their magnets cadmium plated. For the protection of brass condenser leaves cadmium has in some cases been employed instead of aluminum.

Government figures for 1926 show that 800,000 lb. of cadmium as sulphide and metal was used in the United States, and of that amount nearly one-sixth was applied to the protection of metallic surfaces.—C. H. Humphries, *The Iron Age*, Aug. 18.

Small Holes and Burrs

Where small holes are drilled in a production shop considerable trouble results from the burrs formed by the breaking through of the drill. If a drill is carefully fed through the metal, a hole will be made which is practically clear of a burr, but in actual shop practice the pressure applied to the drill and the rate of feed is so high, that it is no exaggeration to say that the drill is used more as a revolving punch than as a cutting tool—hence the burrs.

It has become the custom of many shops to put a burring operation after each drilling job, but this unnecessarily increases the cost as it could be avoided in nearly all cases if proper precautions were taken.

Very often the design of the drill jigs may be made so as to reduce the trouble of burrs. These burrs are caused by the breaking through of the drill when the thickness of metal beneath it is insufficient to take the feed pressure. The rapid rotation of the point acts in a manner analogous to that in the spinning of metals, with the result that the thin layer is thrown out in the form of a frustrated cone with its large diameeter on the outside. If it were possible to constrain the metal so that it would not take this outward spreaded shape, then the drill, as it passed through, would have no alternative but to cut away all the ragged edges. This may be done by machining the hole beneath the one drilled of the same size as that in the drill bushing. This is the principle which should be considered in the design of drill jigs for small holes.

With small work it is not very difficult to make the jig rigid enough to prevent the drill bushing and the underside hole from coming out of line. Another way in which clean holes may be insured is to have a small metal pad clamped underneath the part where the hole is to be drilled. The drill may be made to penetrate the pad only to a minimum degree. When the pad wears it may be replaced by a new one. If this method be adopted no burrs will appear.—*Mechanical World*, Aug. 5.

Nitration of Alloy Steels

The patented Krupp process of steel-nitration is based on the discovery that alloy steels having absorbed nitrogen have a critical temperature of about 1,076 deg. F. (580° C.), at which a peritectoid transformation takes place detrimental to the structure of the protective hard skin of iron nitrate formed, which then readily peels off. But somewhat under that temperature, at say from 930 to 980 deg. F. (500 to 525° C.), depending on the character of the alloy steel treated, some very remarkable and useful results have been obtained by nitration.

Only certain alloy steel show a marked improvement through this treatment as evolved so far. These are steels containing chromium, silicon, molybdenum, aluminum, or vanadium, but other alloy steels, useful for certain of their specific properties, can often be rendered amenable to nitration through the judicious admixture of one of the above mentioned ingredients. A large field for important experimental work along this line seems to be open to modern metallurgy.

As an example of the effect nitration has on certain steels the following may be quoted: A chromium steel of 0.39 C and 2.88 Cr. has, after being heated at 932 deg. F. in an atmosphere of ammonia, shown an increase of hardness from 282 to 471 Brinell. Another chromium-manganese steel, of 0.44 C, 1.93 Cr, and 1.07 Mn, had its hardness number increased from 298 to 500.

The objects to be nitrated are placed loosely in cast-iron pots through which ammonia gas is circulated. The heating is done in an electrical box furnace with very close automatic temperature control. Ninety hours of heating is considered to give the best results; the penetration of nitrogen is then 0.8 mm. or 0.032 in., which is quite sufficient for all practical purposes. After cooling no other treatment is necessary.

The hardness, which is very high at the surface, gradually diminishes toward the interior. For the first 0.2 mm., or 0.008 in., this hardness is higher than for the case-hardened article of the same composition. It is also important to note that at temperatures up to 930 deg. F. the hardness in a nitrated steel does not change much, but with a case-hardened steel the additional hardness will practically have disappeared at that temperature.

Nitration of alloy steels is a process that promises to become of the highest industrial value. It has proved its superiority over case-hardening in many instances and will naturally evolve with the improvements and discoveries due to the numerous research experimentations now under way.—Leon Guillet, *La Genie Civil*, July 9, 16 and 23.

American Methods in European Automobile Production

With a production of about 400 cars daily, André Citroen of Paris, France, is probably the largest foreign builder of automobiles. His factory has concentrated on a single model, low-priced car. Practically all of the special machines used in the production are American. Its all-steel body is made by American methods from sheets imported from the United States. It is finished by an American process. Some of the buildings in which it is manufactured were designed by American engineers, and American process manufacturing and merchandising methods are being used. The Citroen plant sells 60 per cent of its production in Paris and exports the balance. The company has expanded both its domestic and foreign program year after year, but the domestic market is limited as there are only one-tenth the number of cars in proportion to population in France as there are in the United States. The Citroen works comprise six groups of factories within or close to the limits of the city of Paris. Thirty heavy trailer trucks are kept constantly in operation carrying material between the plants, and the management claims that this extra handling is justified because no single location could be found in Paris where the labor market would be adequate. These factories cover a total area of 600,000 square meters, and contain 9,566 machine tools. A list of the various machines used in the factories shows that the products of 40 American machinery manufacturers are represented. The total number of employees in the factory is about 30,000, of which 12 per cent are women. The average pay of the employees is about $1.60 a day. The chief foreign markets for the production are near-by countries and the French colonies.

Within the last two years Citroen has established assembling plants in England, Italy and Germany, and these plants employ 2,000 workers. The company has nine factory branches in France, with 400 agents and 3,000 sub-agents. Other factory branches are located in various foreign countries. The company also controls eight taxicab companies in Paris and other cities. The physical value of the company is estimated at $25,000,000. Up to recently 60 per cent of the capital stock of the company was held by André Citroen, but in June of this year there was a reorganization with an issue of 200,000,000 francs of preferred shares. Under the reorganization plan, the management will be turned over to a board of directors elected by the stockholders.—H. H. Kelly, *Commerce Reports*, July 18.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Trade-in Allowances

TRADE-IN allowances play a bigger part in machine tool sales than many realize. Nor is the effect confined to small shops as might be supposed. Before letting trade-in allowances be the deciding factor several questions should be asked: What is the best machine for the job in hand, regardless of price, prejudice or trade-in? If the old machine has a resale value, should the owner or the builder find a customer? If it cannot be sold readily, or is worth only the price of scrap metal, why should the builder allow more?

If these questions are asked and answered with the same fairness and honesty that we would appreciate if we were the builders of the machines in question, there will be little difficulty in deciding on the new machine.

The Lowest Bidder

BUYING materials, or parts, or complete mechanisms intelligently and economically, is no easy task. It is far more difficult than may appear on the surface. It is much more of a problem than merely writing specifications and asking for bids, though intelligent specifications are not easy to prepare. But, assuming the specifications to be iron-clad in every particular, accepting the lowest bid may be an extravagant waste of money.

Even the responsibility of the bidder does not always solve the problem although it is a vital factor in placing the bid. For there are instances where one well known concern falls down completely on a job, both as to accuracy and delivery, while another seems to have no difficulty in meeting all the conditions imposed. And dependability on delivery is often as important as price, for delays can quickly eat up any saving due to a low bid.

The cost of inspection must also be considered. For there is a world of difference between buying from a concern whose product is so uniform that even occasional inspection is a mere matter of routine, and from one where every piece must be carefully checked before production or assembly.

These are some of the reasons why purchasers should not be compelled to accept the lowest bid. If it is not felt that discretion should be left to one man, let the award be decided by a committee composed of those responsible for results in the various departments affected.

Another View of Replacement

THERE is one factor that enters into the replacement policy of the production shop that is usually not given its due, and that is the effect of old equipment on the workmen. It is a noticeable feature of the new shop with bright new machinery that the workmen are likely to be enthusiastic and up on their toes, with more systematic order generally prevailing. The old shop with dingy old machinery is very frequently also gloomy in the mental attitude of its workmen. There is a tendency to be grouchy. Old machines are not cleaned. Oiling is likely to be irregular.

From the workman's standpoint a machine is obsolete when it begins to look old, even though it may do the work. The average man will strive to prevent the fenders of his new automobile from being bumped, but one or two more bumps or a grinding gear on the old car will not worry him any. It is only just one more viewpoint to consider in the replacement policy.

The Engineer Is a Producer

EVEN though engineers are not endowed with all the wisdom of the world and frequently fail to consider questions from a thoroughly practical viewpoint, they are vitally necessary to the building of machinery of all kinds. And they are usually not sufficiently appreciated when it comes to remuneration.

One general manager is reported to have said that he "sees red" whenever he goes into the engineering department. The sight of men working over a drawing board instead of turning out machines that can be sold for real money, disturbs his idea of a factory. He does not realize that a single new idea worked into his machine, gives him a great selling advantage. Or that a change in design may decrease his cost of production more than any speeding up of tools in the shop.

The modern engineer in machine lines is just as much a producer as the man in the shop. The more he studies shop conditions and works *with* the shop, both as to design and tolerances, the better for all concerned. And the manager who does not appreciate his engineering department needs either a broader vision or a new engineering staff.

Shop Equipment News

Norton 14-Inch Type BA Cylindrical Grinding Machine

THE Norton Co., Worcester, Mass., has developed a heavy-duty, Type BA, cylindrical grinding machine, as illustrated, to handle the class of wide-wheel, straight-in cut grinding work that is beyond the capacity of other grinding machines. It is claimed that the introduction of this machine, having a swing of 14 in., and provision for a wheel width of 15 in., broadens considerably this class of grinding.

The machine is of the same principle as the Norton Type BA construction, including all the features of the 10-in. Type B grinding wheel unit. All dimensions, however, have been increased to provide larger bearing areas and strength ample for the requirements of the heavier wheel and work. The machine is made in lengths to accommodate all work of the class for which it is adapted.

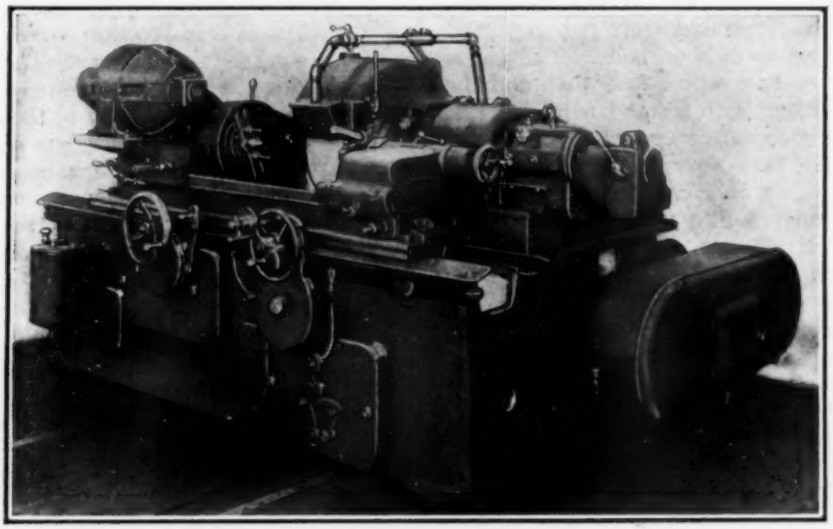


Fig. 1—Norton 14-Inch BA cylindrical grinding machine

The machine is arranged for self-contained motor drive, having a 30-hp., constant-speed motor for the main drive, and a 2-hp. adjustable-speed motor for the headstock. The main drive is from the motor on the rear of the machine through an endless belt to the power shaft in the wheel unit base, which in turn drives the wheel spindle through a 9-in. belt.

The power wheel feed is arranged for 20 infeed speeds through a wide range. The infeed motion is claimed to be steady and positive, and is automatically stopped at the predetermined size by contact of the index with the index pawl. Compensation for wheel wear is easily made by moving the index in increments of 0.00025 in. on the work diameter.

The wheel spindle is of exceptionally heavy design, 42 in. long, and runs in Norton Type B spindle bearings. Lubrication of the spindle bearings is by the forced flood system. A pump geared to the spindle and located below the smaller bearing draws oil from the reservoir and delivers it through valves to the bearings. The spindle drive is from the power shaft below, and results in a downward belt pull.

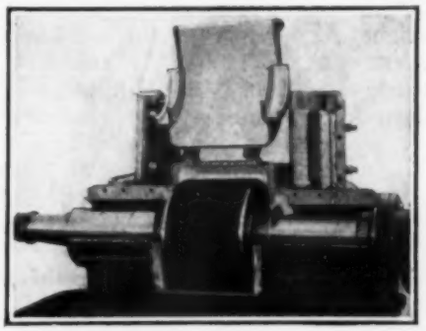


Fig. 3—Spindle mounting and drive

A wheel spindle reciprocating attachment can be applied for moving the wheel back and forth in the direction of its axis. This action is claimed to improve the finish obtained and to result in greater production for each wheel truing. The amount of reciprocation can be changed to suit the requirements of the operation. The maximum motion is $\frac{3}{8}$ in. and the minimum $\frac{1}{8}$ in. It is stopped entirely for wheel truing or shoulder grinding by merely moving the lever on the front of the attachment.

Power table traverse is provided for truing the wheel, and controlled

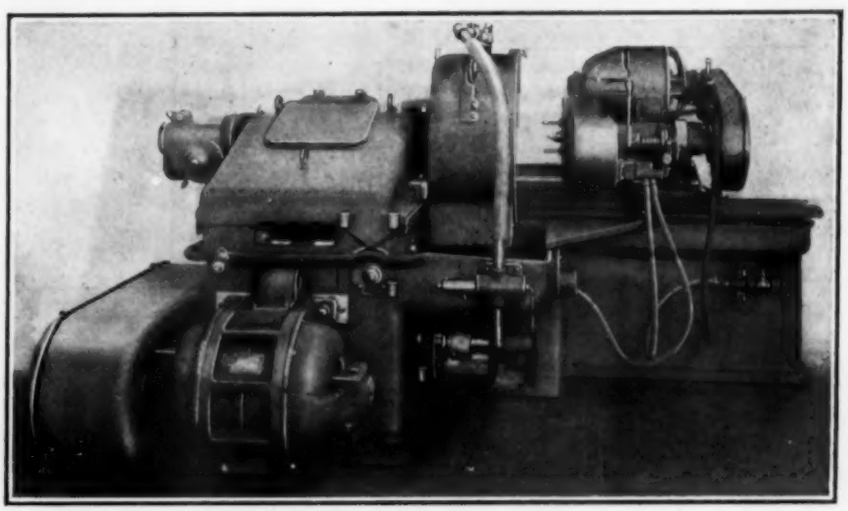


Fig. 2—Rear view of the machine

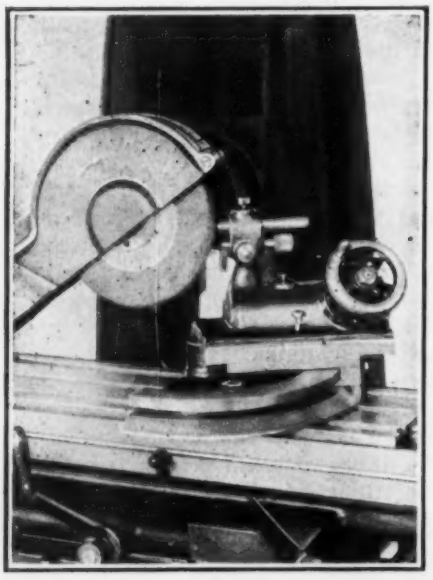
Shop Equipment News

by a lever on the front of the machine. Variable work speeds are available through the use of an adjustable speed headstock motor operating through a drum controller. The weight of the machine in a 24-in. length without motors is approximately 7,800 lb., and with motors about 13,300 pounds.

Brown & Sharpe Wheel Truing Attachment

The Brown & Sharpe Manufacturing Co., Providence, R. I., has placed on the market the radius and angular wheel truing attachment illustrated. The attachment is designed to provide an accurate and efficient means of shaping abrasive wheels used on the No. 2 Brown & Sharpe surface grinding machines.

This attachment permits the forming of both convex and concave outlines having radii varying from 0 to 1 in., and face angles up to 90 deg. either side of zero. Also, numerous combinations of radial and angular shapes can be developed. It is claimed to be particularly useful when grinding such work as lamination dies, and flat forming tools.



Brown & Sharpe Radius and Angular Wheel Truing Attachment

The attachment uses a diamond tool clamped in an upright post on a movable slide. The slide is graduated for fine adjustment, and can be locked in position by means of a clamping screw. A gib and adjusting screws afford a means of compensating for wear. The slide is carried in a swivel which pivots on a hardened steel stud and can be securely clamped in any desired position. The base upon which the swivel is mounted is graduated to 90 deg. either side of zero.

Convex and concave shapes are secured by clamping the slide at the desired radius and swinging the swivel through an arc sufficient to develop the full outline. Angular faces are obtained by clamping the swivel at the desired angle and then passing the slide back and forth by means of the handwheel, the diamond tool being held in the holder at right angles to the slide. The center line of the abrasive wheel is brought to the same height as that of the diamond tool in all cases. The attachment is bolted firmly on the machine table. A raising block, to which the attachment is bolted when a magnetic chuck is used, can also be furnished. The weight of the attachment is 26 pounds.

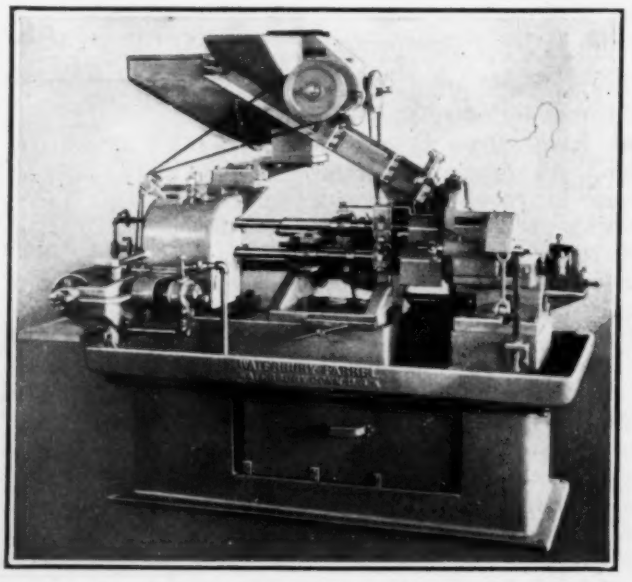
Waterbury-Farrel Automatic Combination Pointer and Threader

THE Waterbury Farrel Foundry & Machine Co., Waterbury, Conn., is offering the automatic machine illustrated for pointing and cutting threads on bolts. The pointing is done with a box tool, and the threading with a standard diehead of any specified commercial type.

The blanks pass from a rotor hopper down an inclined chute to a stop. At this point, a spring pusher forces the blanks into a carrier on a swing sector which operates parallel to the chute. The sector carrier swings the blank down to the carry-in slide, transferring to the pointing station. The upward swing of the carrier causes the pusher to recede, which allows the next blank to drop down to the stop and be pushed into the sector carrier. The carry-in slide has a plate attached in which the blank is held by spring pressure while being transferred. At the end of the carry-in movement, the blank is clamped against fixed jaws, where it is held in line with the pointing tool. After pointing, the blank is swung downward by a pair of spring fingers to the threading station, where it is clamped between a pair of jaws. These jaws hold the blank by yielding pressure and are opened after threading by cam action. The threading of one blank and the pointing of the next occur simultaneously.

The threaded blanks drop into a chute of hinged construction which leads to a work-box at the rear. The work rolls down, after which a hinged pan on the chute swings down so that the chips pass to a removable box in the pedestal, automatically separating the work and chips. The surplus lubricant drips from the end of the chute into a pan in which the work-box is located, and thence to the supply tank in the pedestal. The work-box is provided with a hand-lever to pivot it and dump the work.

The tool spindles are hollow, and the lubricant is pumped through them from the back, thus keeping the tools flushed out and free from clogging chips. All pointing and thread-



Waterbury-Farrel Automatic Pointer and Threader

Shop Equipment News

ing is performed under spring pressure, but the spindles are returned by positive cam action, as are all movements that are liable to be affected by variations in the size of work or by obstructions. Only one adjustment is required for changing from one length of blank to another, which consists of simply relocating the sliding spindle head on the bed of the machine.

Change gears for changing the length and pitch of thread are easily replaced without dismantling any part of the machine; also the change gear for changing the cutting speed, all of which are inclosed in a gear box. A complete change gear chart is furnished with each machine and one set of change gears for producing any specified size of bolt is supplied.

The machine can be arranged for either right-angle or straight belt drive to an overhead countershaft or line shaft, as well as for individual motor drive. It can be started and stopped from either side.

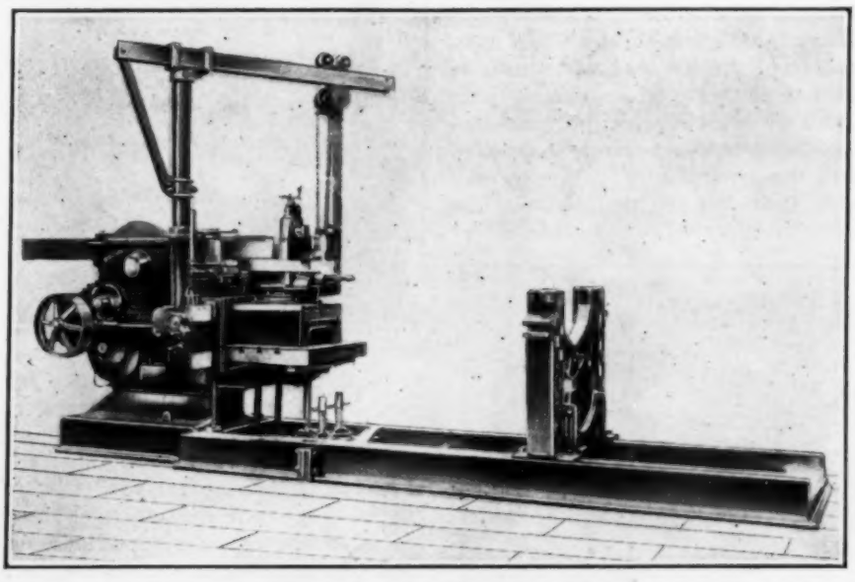
The machine illustrated has a capacity for $\frac{3}{8}$-in. bolts, $\frac{3}{4}$ to 6 in. long under the head. It will thread up to within $\frac{1}{4}$ in. of the underside of the head, and will cut a thread $2\frac{1}{4}$ in. long. The cutting speeds range from 25 to 45 ft. per min., and the production is from 360 to 2,000 bolts per hour. This machine occupies a floor space of 73 ft. x 40 ft. and weighs 3,250 lb. Other sizes of machines can be had for handling bolts of any specified size.

Morton Combination Draw-Cut and Roll Wabble Shaper

THE Morton Manufacturing Co., Muskegon Heights, Mich., has placed on the market the combined heavy-duty draw-cut and roll wabble shaper shown in the illustration. It is designed especially for shops manufacturing rolls, or for those using rolling mill equipment where there are only a few rolls to be machined and considerable heavy-duty shaping and planing work. It is intended to machine the ends of any type or length of roll up to 56 in. roll diameter and 28 in. neck diameter.

The shaper has 48 in. of cutting stroke with 18 in. of vertical feed, and can be furnished with 36, 48 or 60 in. of horizontal feed on the cross-rail. The general construction and operation of the machine is similar to the other heavy-duty draw-cut shapers made by this company. It is said to be quickly converted from a draw-cut to a push cut shaper for the cutting of pods in rolls.

The machine is equipped with an auxiliary top plate and a heavy steel vise for general work. It also is fitted with a large T-slotted work table, crane and hoist, a set of O. K. tools and holders for general work, and a special V-block for holding the rolls. It can be furnished either for belt or motor drive.

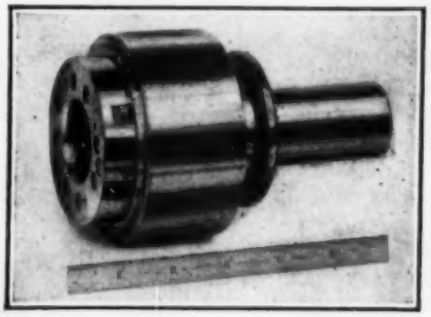


Morton Draw-Cut and Roll Wabble Shaper

H&G Style EE Diehead

The Style EE H&G diehead is announced by the Eastern Machine Screw Corporation, New Haven, Conn. It is designed for use on rotating die spindles. The head is both opened and closed by means of one yoke which engages the spool or groove in the rear of the head.

The improved style of head has a smaller outside diameter, an improved locking and tripping mechanism, and is lighter in weight than the previous models put out by this company. It is claimed to provide accurate adjustment for length of thread cut and, because of its single-yoke construction, installation on automatic screw machines is said to be simplified. The same basic principle of holding the chasers and supporting them directly over the chamfer has been retained as has the positive opening action as in other H&G dieheads. The same chasers may also be used.



H&G Style EE Diehead

The Style EE head is available in the following sizes: $\frac{7}{16}$ in. with outside diameter of $2\frac{3}{8}$ in., $\frac{9}{16}$ in. with outside diameter of $2\frac{7}{8}$ in., 1 in. with outside diameter of $3\frac{1}{8}$ in. and $1\frac{1}{4}$ in. with outside diameter of $4\frac{5}{8}$ in.

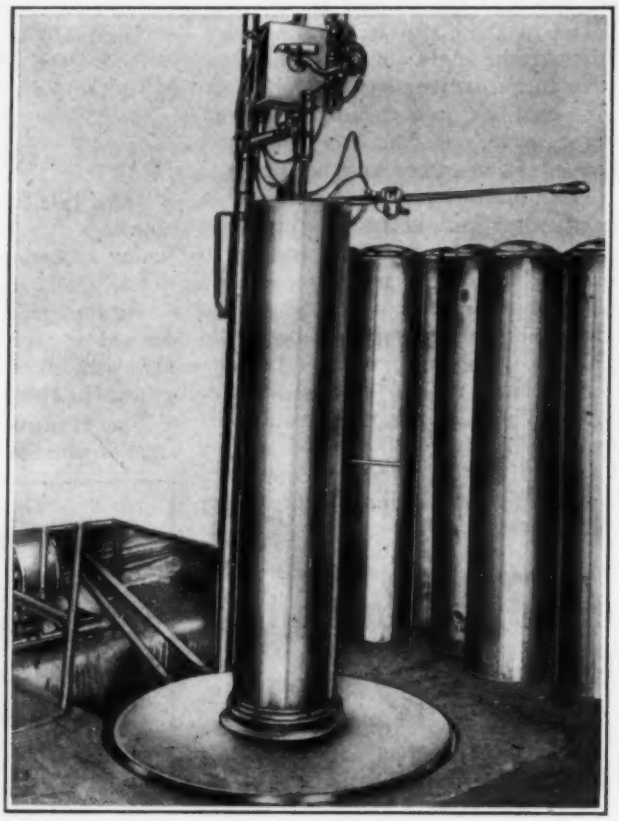
Lincoln Automatic Bottom Welder for Tanks

The Lincoln Electric Co., Cleveland, Ohio, has just placed on the market a carbon-arc automatic welding machine, designed for welding bottom seams on cylindrical tanks. The illustration shows the machine welding range boilers.

The equipment is standardized for

Shop Equipment News

tanks up to 6 ft. in diam. and 8 ft. high, but special equipment may be furnished to handle any diameter or length of tank. A welding rate of 135 ft. per hr. is claimed for the lap head seam shown on the tanks illustrated, which are of 14-gage material. Tanks to be welded are set on the revolving table, and the arm carrying the automatic welding head is adjusted to bring the arc on the seam. The speed of the revolving table is adjustable to handle various sizes of tanks, and the welding current is also adjustable by means of the control on the welder control panel. Automatic stop and start control is located on the automatic welder head. The automatic welder is claimed to be especially suitable for the production welding of large numbers of small diameter tanks, such as the range boilers shown in the accompanying illustration.



Lincoln Automatic Tank Welder

Walker Improved Magnetic Chucks

THE O. S. Walker Co., Inc., Worcester, Mass., has brought out a line of improved magnetic chucks. The all-steel rotary magnetic chuck shown in Fig. 1 is intended for a specially designed vertical spindle surface grinding machine. The outside diameter is 100 in., the inside diameter 70 in., making the face of the chuck 15 in. in width, all of which is magnetically active. Current is taken to the chuck through a hollow post set in the center of the machine table, and to this post the leads from ten segments of the chuck are carried through pipes, thereby making all connections water-tight. The main lead from the ten lead wires runs to the top of this post, connecting with a pair of brushes which in turn connect with contact rings connected with the generator. The boring mill table speed on the periphery of the chuck is expected to be 4,000 ft. per min. The chuck will require 3,360 watts for its operation, and the approximate weight of the chuck is 4,500 pounds.

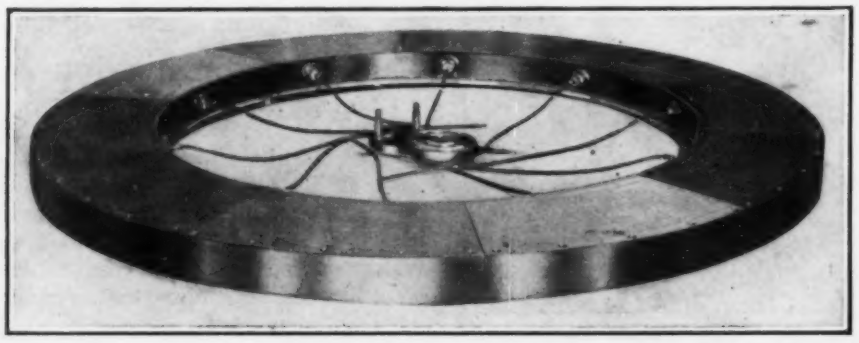


Fig. 1—Walker Rotary Magnetic Chuck

In Fig. 2 is shown a chuck adapted for grinding of knife bars and similar work where it is desirable to grind

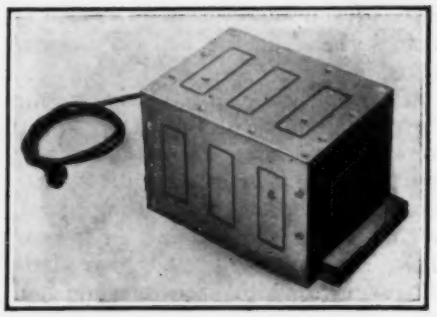


Fig. 2—Walker Magnetic Chuck for Knife Bars

both sides and edges without disturbing the setting of the chuck. This is also applicable to work in which the edges are to be finished at right angles to the sides, as in the case of heavy shear blades. The chuck contains one coil which, when energized, develops magnetism in both the vertical and horizontal faces of the chuck at the same time. The chuck is 9½ in. high and 9½ in. in width. It can be made in any length.

The chuck shown in Fig. 3 is claimed to be another unique development in magnetic chucks in that both front and back faces of the chuck are magnetically active when the coil is energized. The chuck is 11 in. high and 14 in. in length. In this case the chucks were developed for a special job, and several chucks are placed in line on the table for holding channels on an automatic drilling machine. The chucks can also be built with a variety of divisions of the

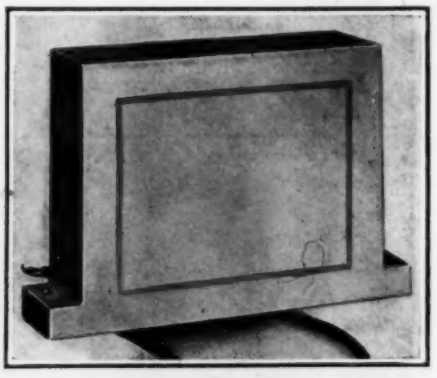


Fig. 3—Walker Magnetic Chuck for Channels

Shop Equipment News

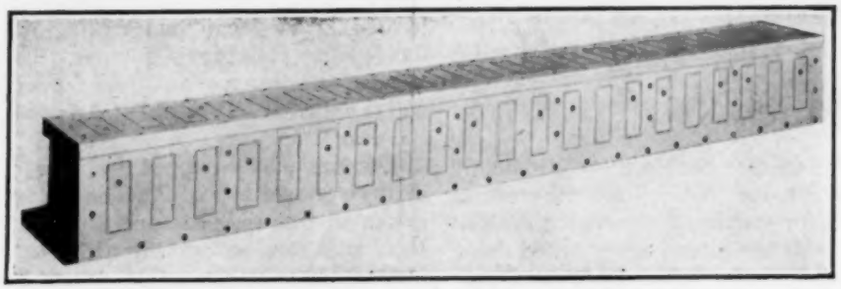


Fig. 4—Walker Magnetic Chuck for Shear Blades

chuck face. The chuck requires 150 watts, and its weight is 165 pounds.

The chuck shown in Fig. 4 is claimed to be very powerful, and is for use on face grinding machines, for grinding shear blades on the sides and edges without disturbing the setting of the chuck. This chuck is of similar design to that shown in Fig. 2, but is longer. Both vertical and horizontal faces of the chuck are magnetized at the same time. The chuck is 9½ in. high, 9½ in. wide and 84 in. long. The chuck requires 735 watts for its operation and weighs approximately 1,650 pounds.

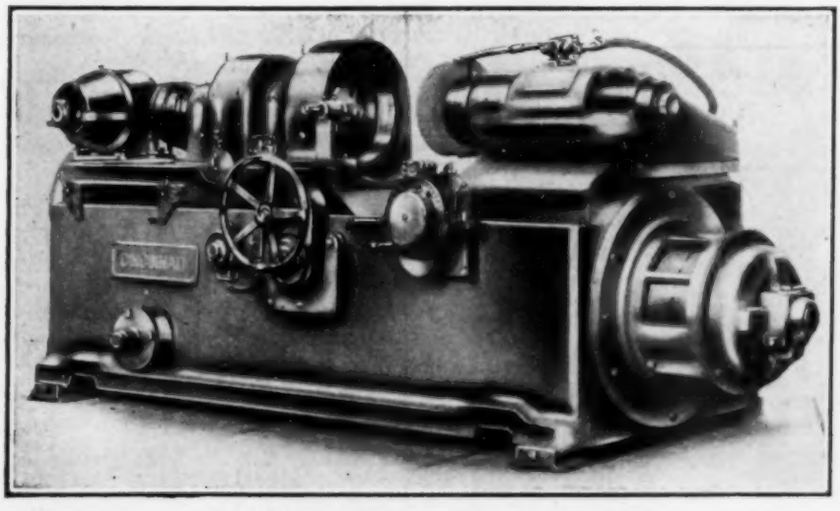
Cincinnati Brake Drum Grinder

THE Cincinnati Grinders, Inc., has developed the machine illustrated for the production grinding of automobile brake drums. It is claimed that this machine revolutionizes the method of brake drum grinding and makes possible the grinding of drums at a speed of one minute each, or a regular production rate of 45 per hour.

The grinder is entirely self-contained, with a 30-hp. motor built into the machine and a Texrope drive to insure smoothness. The spindle of the machine is heavy and of large proportions, in order to eliminate vibration and make it possible to take heavy cuts with the grinding wheel. A grinding wheel 14 in. in diam. and 3 in. face is used.

The work is held on a heavy faceplate by means of quick-acting air chucks. Dead stop sizing on the grinding wheel in-feed is made possible by a dial gage located in position. The wheel truing tool is also permanently located. The 2-hp. workhead motor is of the variable-speed type, and is controlled by a rheostat conveniently located. Starting and stopping of the work rotation is by push button control, and the rotation is stopped instantly by a dynamic brake. The work saddle is provided with an adjustable dead stop to facilitate positioning of the work in relation to the grinding wheel.

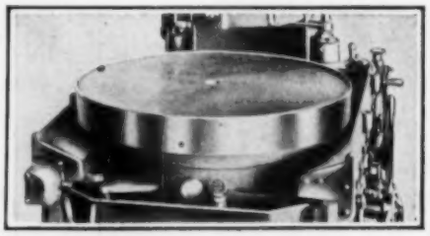
A tank is built into the machine, and contains a pump which is constantly primed. When direct current is not available, a generator may be attached to the machine. The machine is entirely electrically controlled, and is claimed to be so designed that every possible idle movement consuming unproductive time has been eliminated. In grinding an 18-in. diam. drum with a 3-in. face a production time of one minute per drum was obtained, removing 0.008 in. from the diameter. The work was held to limits of plus or minus 0.003, and a good commercial finish was required.



Cincinnati Brake Drum Grinder

Blanchard 36-Inch Magnetic Chuck

The Blanchard Machine Co., Cambridge 39, Mass., has announced an oversize magnetic chuck 36 in. in diam., developed for its No. 16 high-power surface grinder. This is a complete magnetic chuck built into the machine in place of the standard 26-in. chuck, and is not removable. It reduces the vertical range of belted machines to 8 in., and of direct motor drive machines to 10 in. The face of the chuck is of the finely-divided type, similar to the standard chuck, but it is magnetic to the extreme edge.



Blanchard 36-In. Magnetic Chuck

The one-piece steel construction is claimed to insure a water-tight and durable chuck. The guards and way covers for this chuck are different from those used with the 26-in. and 30-in. chucks, and various heights of guards can be furnished to suit the work. By using special large guards and extra height of column, the No. 16 Blanchard grinder will handle such large work as two cylinder blocks 30⅜ in.x14½ in.x14⅜ in. at one time. The chuck is recommended for rings up to 36 in. in diam., for long and irregular pieces, and for attrition mill plates up to 36 in. It is also suitable for small pieces, in which case a large open space should be left in the center of the chuck in order to avoid excessive area of wheel contact.

Shop Equipment News

Landis 16-Inch Pipe Threading and Cutting-Off Machine

THE Landis Machine Co., Waynesboro, Pa., has added a 16-in. size to its line of pipe threading and cutting-off machines. This machine has a range from 8 in. to 16 in., inclusive, the entire range being covered by one diehead and one set of chasers.

The carriage travel of the machine is 25 in., and it has eight speeds. In Fig. 1 is shown the operating side of the machine. The gear box is located beneath the main spindle. All gears are of steel, and are run in an oil bath. The shaft bearings are lubricated by a forced feed system. The main bearings are lubricated by flat link chains running in oil reservoirs.

A reverse drive located in the gear box is used for putting on and taking off flanges. Levers are conveniently located for controlling the reverse and for starting and stopping the machine when threading, or when doing flange work. The front and rear gripping chucks have universal adjustment, and the rear chuck is equipped with flange grip. Both chucks are of the three-jaw type, as in previous models.

The cross-rail supports the diehead, and is fitted at the rear with centering jaws, cutting-off tool, and reaming tool. The reaming tool may be locked for the reaming operation. This same tool can also be employed for chamfering the end of pipe. The die lubricating system includes a rotary pump, a by-pass for the surface oil, and a special control valve located at the head and cutting-off tool. The machine employs the Landis stationary pipe die head and Landis "Long Life" tangential chasers.

The machine, equipped for motor drive, is shown in Fig. 2. The motor is mounted on the plate over the gear box, and can be applied after the machine is in service. The power is transmitted from the motor by means of a silent chain. A 20-hp., constant-speed motor, giving an approximate speed of 1,200 r.p.m., is required. The floor space required for the machine is 6 ft. 2 in. by 11 ft. 6 in. When belt driven it weighs 16,900 lb., and motor driven 18,000 pounds.

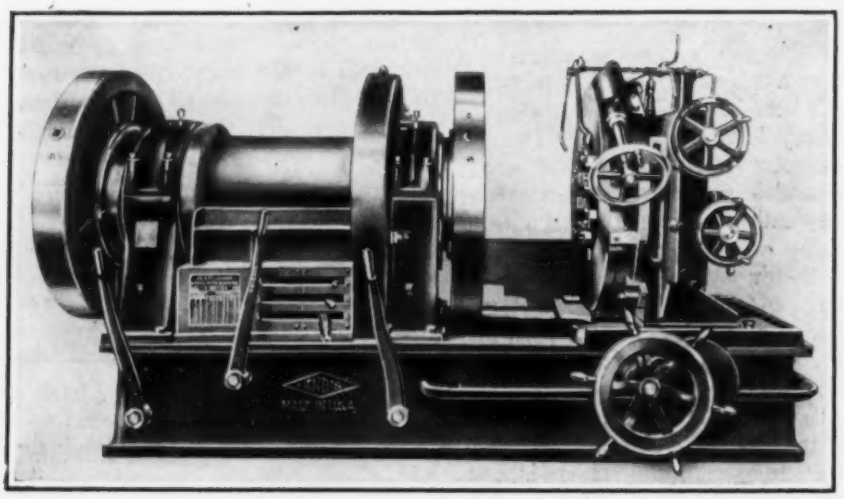


Fig. 1—Landis 16-In. Pipe Threading and Cutting-Off Machine

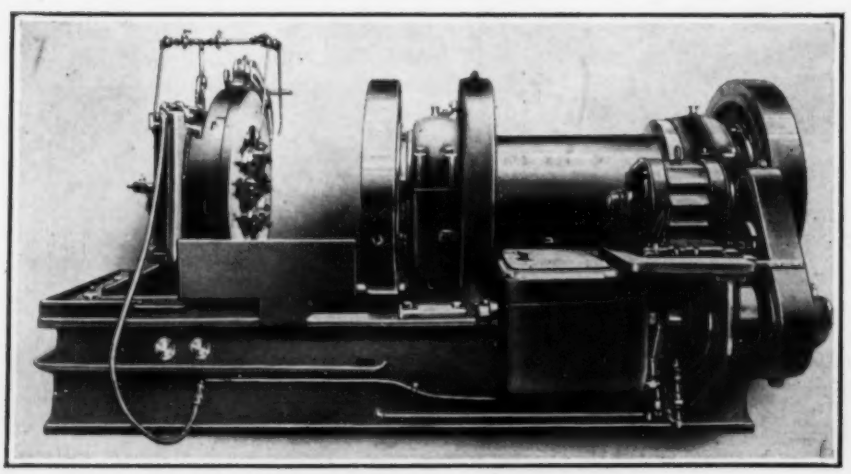
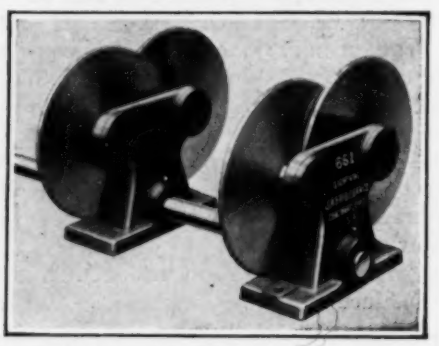


Fig. 2—Rear view of machine equipped for motor drive

Fay & Egan No. 661 Ball Bearing Static Balancing Machine

A portable static balancing machine, mounted on ball bearings, was recently placed on the market by the J. A. Fay & Egan Co., Cincinnati, Ohio. It can be set up at any place and no leveling is required. All parts up to 100 lb. in weight such as pulleys, flywheels, fans, cutterheads for woodworking machines and the like, can be accurately balanced, it is claimed.



Fay & Egan No. 661 Static Balancing Machine

The revolving plates and their axis are made of one-piece steel, case hardened and ground in position. Deep-groove precision ball bearings are used, lubricated by light machine oil. The balance stands may be placed any distance apart or as close as 3 in. The unit is regularly furnished, however, with an adjusting bar for 24 in. between plates. A sensitivity of $\frac{1}{8}$ oz.-in. is claimed for this type of machine, which was developed particularly for balancing planer heads.

Shop Equipment News

Norton Automatic Indexing Cam Grinding Attachment

THE Norton Co., Worcester, Mass., has placed on the market an automatic indexing cam grinding attachment which is claimed to be a marked advancement in cam grinding practice. The attachment is intended to be applied to Norton Type A and Type BA cylindrical grinding machines for use in grinding cams integral with the shaft.

Only two manual operations are required at each indexing of the shaft in grinding cams on a machine equipped with the automatic indexing cam grinding attachment. These motions consist in the backing off of the wheel index and the hand traverse of the table to bring the next cam into position in front of the wheel. The automatic movement of the rocking bar and of the master cam roll are by pneumatic and mechanical control. These movements take place as the wheel index and table are moved into position for grinding. This positioning is positive in its function and relieves the operator of hand motion. It is claimed that higher production can be obtained with a lower percentage of scrap.

In operation, the wheel feed index is backed a short turn at the end of the grinding cut by the automatic control, which also rocks the camshaft forward from the wheel, making it possible to move the table to bring the next cam on the shaft in front of the grinding wheel. The traverse of the table automatically indexes the master cam roller to the master cam for the cam in front of the wheel. When the wheel is again fed toward the shaft the rocking bar is released to give contact between the master cam and roller. The feed is continued to the index stop to bring the cam to size, completing the grinding cycle for that cut.

The automatic indexing cam grinding attachment can be applied to cam grinding machines in the field by substituting the parts linked with the automatic operation for those of the hand-controlled fixture.

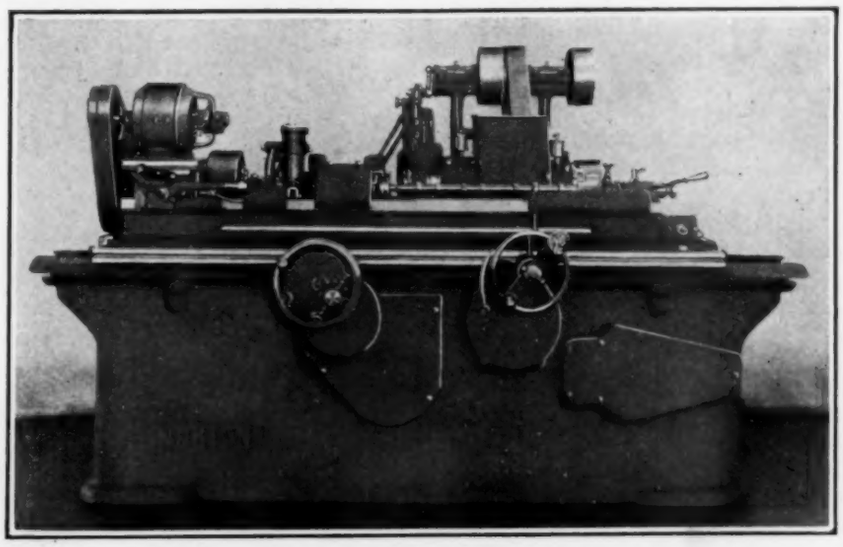


Fig. 1—Automatic Cam-Grinding Attachment applied to a Norton Grinder

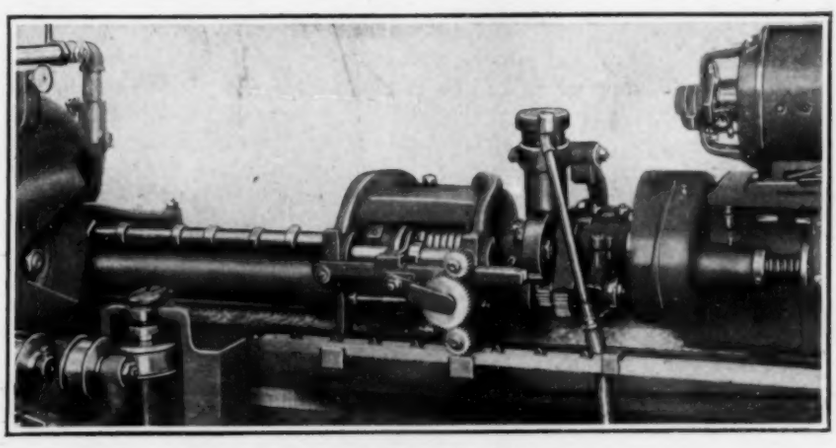


Fig. 2—Rear view of attachment

Bethel-Player Lapping Head and "Newgrit" Abrasive

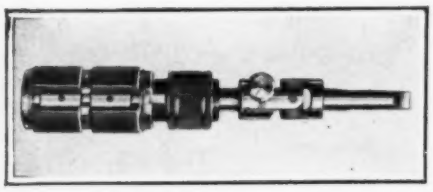
The lapping head here shown, manufactured by the Bethel-Player Co., Westboro, Mass., is designed to use the new form of abrasive known as "Newgrit," that has been developed by this company. The head is driven through a full-floating universal joint that allows it to align itself with the hole being lapped without restraint from the driving member.

The head is hollow, and contains a spindle that is capable of end movement within a limited range. The spindle carries two hardened steel cones by which the active members of the head are supported. End movement is imparted to the spindle by turning the knurled sleeve, thus collapsing or expanding the active members. In re-expanding the abrasive blocks the end movement of the spindle is stopped by a micrometer-graduated screw to be seen above the knurled sleeve, thus determining the active diameter of the tool in increments of 0.001 inch.

The "Newgrit" material consists of a metallic alloy of which the abrasive is a large constituent. It has been likened to a lead lap in which the abrasive is evenly distributed throughout the structure instead of merely embedded in the surface. It can be cast in any desired shape and machined with diamond tools to accurate dimensions.

It possesses the advantage that it can be clamped to the lapping head or other tool with which it is to be applied by any means that can be employed to secure a block of metal of

Shop Equipment News



Bethel-Player Lapping Head with "Newgrit" Abrasive

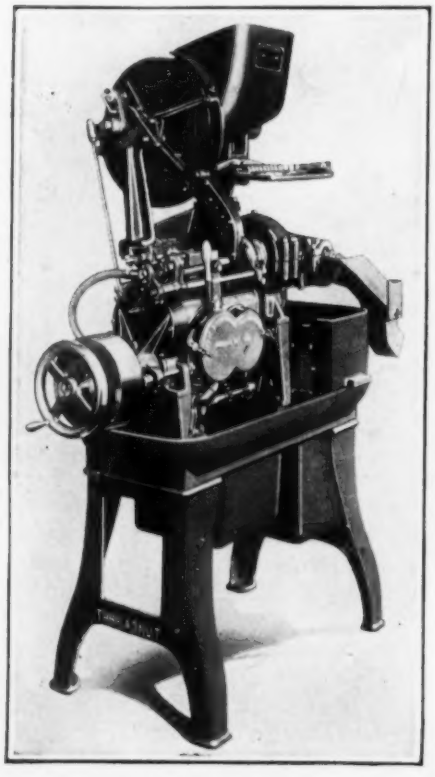
corresponding shape. In the tool here shown the abrasive blocks are beveled on both edges and secured to the head by clamping pieces screwed to the head.

It is applicable to any of the circular lapping machines or devices made by this company. When worn, it can be restored to its original shape and diameter by resetting the micrometer screw, putting the head on centers in a lathe, and turning with a diamond tool. No loose abrasive is used in connection with it, and in service it is flooded with plain or soda water only in order to keep down the temperature.

The claim is made that "Newgrit" abrasive can be safely employed to lap soft metals that would become dangerously charged with abrasive by any ordinary method of lapping, and that no adhesive sludge is formed upon the tool or work.

Automatic "Threadnut" Nut Threading Machine

AN AUTOMATIC nut threading machine of the continuous tapper type is anounced by the Automatic Nut Thread Corp., 24 West Tupper St., Buffalo, N. Y. The machine uses a bent shank tap, and is intended for high-production work. It has a capacity for tapping hexagon or square hot-pressed, cold-punched, or brass nuts from $\frac{9}{16}$ in. U.S.S. to $\frac{7}{8}$ in. S.A.E., special tooling being provided for the intervening sizes.



Automatic "Threadnut" Nut Threading Machine

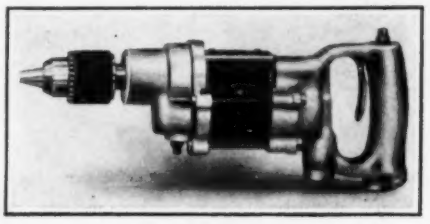
The machine is fully automatic, with hopper feed, and has a recommended production speed of 15 U.S.S. nuts and 10 S.A.E. nuts per min., although it is claimed that higher production has been obtained on tests. The machine uses a bent shank tap of the standard design listed by leading tap manufacturers, but the hardness of the tap may be greater than that of those usually furnished because of the method of holding. High-speed steel taps may also be used.

The general design of the machine is said to embody the most up-to-date improvements. The machine is equipped with a single clutch pulley drive and an automatic safety clutch throwout to stop the machine if for any reason the feeding mechanism becomes clogged. Ball bearings are installed throughout, and all bearings and gears are inclosed and run in a bath of oil. The hopper is of the rotary drum type. It is claimed that the machine is easily changed from one size of nut to another, requiring only 15 to 30 min. to make the change.

Rotor High-Production Air Drills

The Rotor Air Tool Co., 5905 Carnegie Ave., Cleveland, Ohio, has announced three high-production air drills in capacities of $\frac{1}{4}$, $\frac{3}{8}$, and $\frac{1}{2}$ in. These drills embody the rotor motor, and are claimed to have unusual power and to maintain the correct feed for the most efficient cutting of metal under working conditions.

The motor has twin eccentric rotors mounted on the spindle, which runs in ball bearings. A special governor controls the speed of the machine, cutting down the air when running idle and opening the airports as the load on the motor is increased.



Rotor High-Production Air Drill

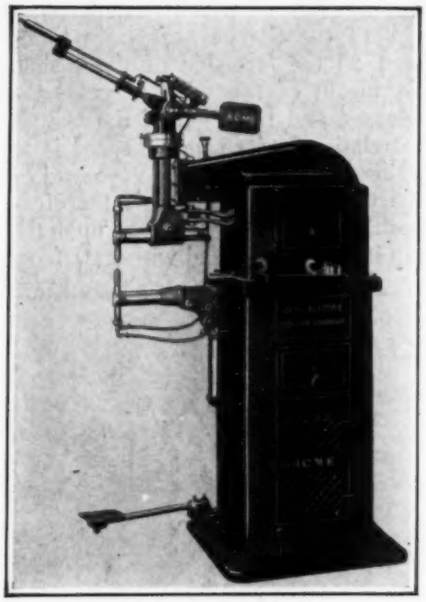
The drills are designed to permit close corner work. The Jacobs chuck is furnished as standard equipment. Aluminum alloys have been used in the construction in order to keep the weight low, the $\frac{1}{2}$-in. drill weighing $7\frac{1}{4}$ lb. and the $\frac{3}{8}$-in. drill weighing $6\frac{1}{2}$ lb. The drill may be dismantled by removal of four outside bolts, making easy inspection and maintenance.

Acme Type C Spot Welders

For heavy work on flat sheets and formed parts where considerable pressure is required to bring the pieces firmly together to be welded but where no great depth of throat is needed, the type C spot welders have been developed by the Acme Electric Welder Co., Los Angeles, Cal. The unit is particularly useful in the manufacture of wrought-iron fixtures, ornamental iron work, switch boxes and heavy metal parts where considerable pressure is required. The machine can be operated by a treadle for production work or by hand for heavy-duty work.

The lower horn is of the same construction as the other types of Acme spot welders and is mounted on a vertical column. This arrangement permits the horn to be swung to either side of the machine or raised and lowered. With this construction the horns and electrodes can be set in many combinations so that all sorts of odd-shaped pieces can be handled. In addition the horns are reversible so

Shop Equipment News



Acme Type C-15 Spot Welder

that dies can be placed at various angles. The electrodes themselves are water cooled and are 1 in. in diam. to insure long life. Adjustment of the horns or electrodes can be made by loosening one draw bolt. The electrodes are set at such a height as to allow the operator to stand in an erect position, thus increasing the speed of production, it is claimed.

All movable parts are inclosed within the base of the welder but are easily reached through a door in the rear. The current is controlled through a magnetic switch mounted in the base and operated automatically by the treadle or through a thumb button in the hand lever. The automatic switch increases the pressure in the die points after the current is cut off. The treadle can be swiveled to either side of the welder. For hand operation, the toggle type head gives great pressure with little effort. An 8-step rheostat is used for regulating the voltage at the welding point.

The type C welders can be furnished in two depths of throat. The specifications are as follows:

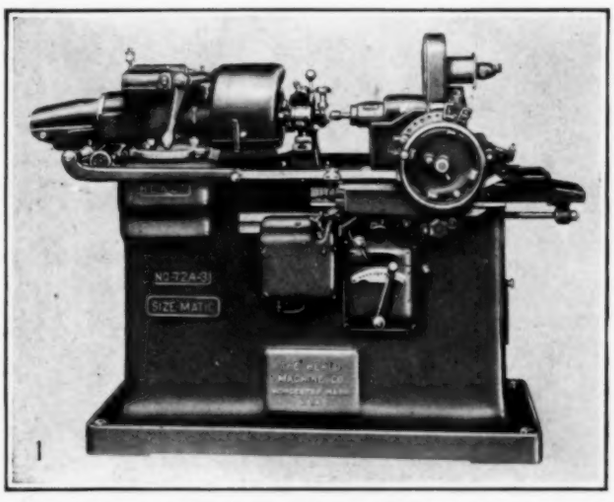
Type	C-15	C-25
Depth of throat, in.	18	32
Drop of lower horn on column, in.	10	13
Vertical movement of upper horn, in.	2	2
Welding capacity, gage No.	6 to 28	4 to 29
Transformer capacity, kw.	15	25
Weight, lb.	1,300	2,000

Heald Style 72-A Internal Grinding Machines

AN IMPROVED series of internal grinding machines made in the plain, semi-automatic and Size-Matic types, known as style No. 72-A, has been placed on the market by the Heald Machine Co., Worcester, Mass., to replace their line of style No. 72 machines. An additional model has been added to the line known as No. 72A-2 to meet the demand for a machine with a short base for handling work not over 2 in. in length such as ball races, gears, rings and the like. It has ways 55 in. long and occupies a total floor space of 108 x 50 in. It can be furnished in either belt or full motor drive and in the Size-Matic style only. Many improvements have been incorporated in this small model that have been adapted to the entire line of internal grinding machines, as will be indicated below.

The principal working units such as the hydraulic drive for the table, the all-ball-bearing workhead, automatic micrometer diamond, and cross-slide, still remain with slight improvements. The base is designed with both ends cast straight down from the ends of the ways to a foot which has been made wider and is cupped shape. This construction results in a reservoir to catch any coolant that may escape the guards. The height of the base has been shortened so that the distance from the floor to the center of the work spindle is 44 in., instead of 47⅛ in. as on the style No. 72 machines. This makes a more convenient work height for the operator.

As most internal grinding machines engaged in production work operate continuously upon one size and shape of work, the machines are equipped with a single speed workhead drive on both the belt- and motor-driven machines. In the belt-driven machines a single speed countershaft is furnished from which a belt drives directly down to a pulley on the back shaft and from there to the workhead. The wheelhead is driven as before from a long drum on the countershaft. Where there is a variety of sizes of work and a number of speed changes is desirable, a five-speed



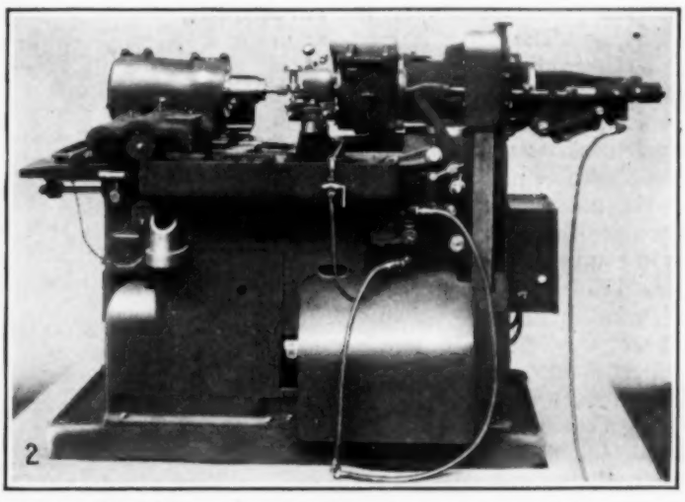


Fig. 1—Heald No. 72A-3 Size-Matic Internal Grinding Machine. Fig. 2—Rear view of the machine

Shop Equipment News

countershaft and jackshaft can be supplied as for the previous series.

For the two-motor drive machines the back shaft motor is arranged with a double-end armature shaft. On one end is a pulley for driving the workhead. The other end is directly connected to the oil pump through a coupling which in itself is a pulley from which the water pump is driven and which also carries a sprocket that drives the generator through a silent chain. This construction has eliminated the former backshaft, thus simplifying the drive.

On the three-motor drive machine the motor at the rear has a single-end shaft and drives (in a similar manner as the two-motor drive), the water pump, oil pump and generator. The workhead is arranged with an individual adjustable-speed d.c. motor mounted on the top. The wheelhead drive remains the same as previous.

The slow down valve and diamond control has been simplied in construction. It is now located at the right hand end of the rear of the base where it is said to be out of the way from all water and dirt and in a convenient position for adjustment. A guard covers the entire back of the machine keeping out foreign matter as well as safeguarding the workmen. The guard also betters the appearance of the machine.

In addition to the model No. 72A-2, there is a model No. 72A-3, which has ways 61 in. long and is similar to the standard style No. 72 machine. It can be furnished as a plain machine, automatic or Size-Matic with either belt or full motor drive.

Model No. 72A-5 has a 12-in. extended base and ways 73 in. long. It can also be supplied in the plain, semi-automatic or Size-Matic types with belt or full motor drive. In all machines the swing over the table is 15½ in. except in the semi-full types where it is 11½ in. The swing inside of the standard water guard is 12 in., however, in all cases. In all types standard work head speeds of 230, 280, 320, 365, 385, 460, 505, and 640 r.p.m. can be supplied. The table speeds can be varied from 0 to 50 ft. per min. in each case.

Langelier Automatic Tapping Heads

THE Langelier Manufacturing Co., Providence, R. I., has placed on the market an automatic tapping head intended to be used in conjunction with automatic machines on mass production or individually upon jobs the magnitude of which does not warrant the construction of a special machine.

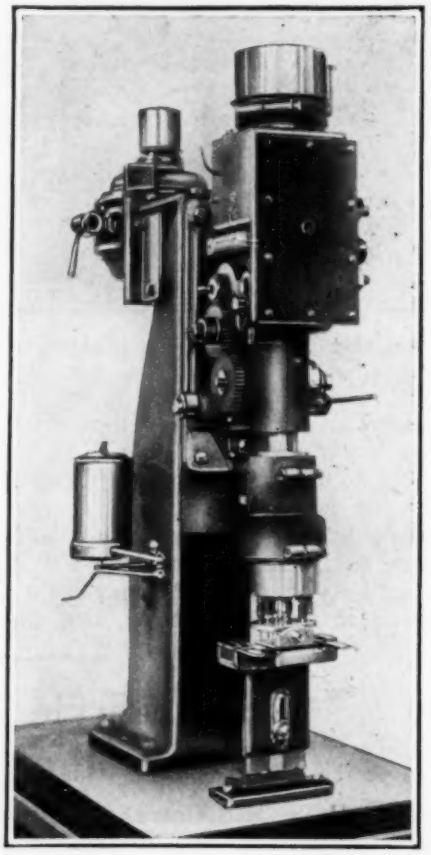
As shown in the illustration, the unit is mounted on a column that is adaptable to it or to other appliances and mechanisms made by the same company. The drive is by belt; in this case from a motor mounted upon the column with the axis of its rotor vertical, but may be from an overhead lineshaft of any other convenient source of power.

The mechanism to rotate and reciprocate the spindle is all contained in the upper casing, while the tapping heads, containing any number of spindles disposed in any desired geometric pattern at any required center distance, are interchangeable in the lower holder. The tapping heads must be made to specifications, as the spindle positions, once located, are not adjustable.

The pulley at the top of the case is keyed to a quill, on the lower end of which is one member of a Johnson reversing clutch, the other member of which is driven by suitable gearing from the first in reverse direction at higher speed. Between these two members is the clutch-cone for engaging with one or the other of the constantly revolving members according to the setting of the reversing mechanism.

A rotating disk, easily accessible on the side of the casing opposite to that here shown, is worm-driven from the spindle and thus has a forward and backward motion of an amplitude and duration determined by the setting of reversing dogs, which are adjustable to any point of a circular T-slot in the face of the disk to give any length of stroke within the capacity of the mechanism. The dogs operate a spring-loaded lever to drive the clutch-cone into engagement alternately with the positively-driven members and thus impart the speed and direction of rotation of the latter to the spindle.

The reciprocating motion (endwise) of the spindle is derived through a rack-and-pinion movement, one member of which is under control of the change gear train to be seen on the left side of the casing. By means of this train of gears the advance and recession of the spindle in relation to its rotative speed is so adjusted as to be equal to the lead of the tap being used and is therefore positive, without dependence upon the tap itself to enter and withdraw from the work. Stripping of threads is thereby avoided, it is claimed.



Langelier Automatic Tapping Head

By a simple adjustment, the cycle can be made continuous and entirely automatic, or it may be set to go out of action upon completion of each stroke. In the latter setting a mere pressure upon the end of the finger lever is required to bring the cycle into action each time.

These mechanisms are now available in three sizes: No. 12 for taps from $\frac{3}{32}$ to $\frac{1}{4}$ in. diameter, 48 to 18 pitch; No. 22 for taps from $\frac{3}{16}$ to $\frac{3}{8}$ in. diameter, 36 to 12 pitch; and No. 32 for taps $\frac{1}{4}$ to $\frac{5}{8}$ in. diameter, 24 to 8 pitch. The column here shown is not considered a part of the mechanism, but can be furnished if desired. All tapping heads are special in respect to the positions of the taps.

Shop Equipment News

Fosdick Heavy-Duty Radial Drill

ONE of the outstanding features of the line of heavy-duty radial drills, made in 5-, 6-, and 7-ft. sizes by the Fosdick Machine Tool Co., Cincinnati, Ohio, is the fact that all control movements are operated from the head. The machines are built upon the unit principle and are automatically lubricated. The manufacturer points out the following additional features:

A table having a liberal working surface and being of rigid construction, that can be tilted and clamped at any angle; base, column, sleeve, and arm made of high-steel content semi-steel of massive construction for rigidity; a base of deep box section with a large working surface; a large diameter column with flange of unusual thickness and column sleeve with increased clamping area. A hardened and ground roller bearing is at the base of the column in order to facilitate swinging of the arm about the column.

The arm is of double-box and I-beam section, and has a barrel of unusual length. Automatic safety limit stops and a safety catch are provided. Unlocking, raising, and lowering, also clamping the arm, are all operated from the head, thus eliminating the waste of time necessary when operator has to leave the spindle in order to elevate or lower the arm. An interlocking type of arm clamp is used, making it impossible to elevate or to lower arm with the clamp engaged. The power rapid traverse of the head, built in the arm, is gear connected and is arranged so that the handwheel does not revolve when the feed is engaged. Automatic lubrication is included in this unit.

Engagement of the traverse in either direction is controlled by a friction clutch. Automatic stops are provided at extremes of travel.

The power column clamp, operated by a separate motor, is push-button controlled from a switch positioned on the head. All control wires are automatically wound on a reel, having a spring sheave, so that by having them in tension rather than hanging, there is less danger of their being broken. This unit also is automatically lubricated.

Two sets of spindle speeds are available, these being dependent upon the speed of the motor. They range from 14 to 1,010 r.p.m. and from 20 to 1,406 r.p.m. A total of thirty-six speed changes are provided, all changes being obtained by seventeen hardened alloy steel sliding gears in the head. Three levers are used to control these speeds. Automatic lubrication with filtered oil is furnished the gears and their bearings.

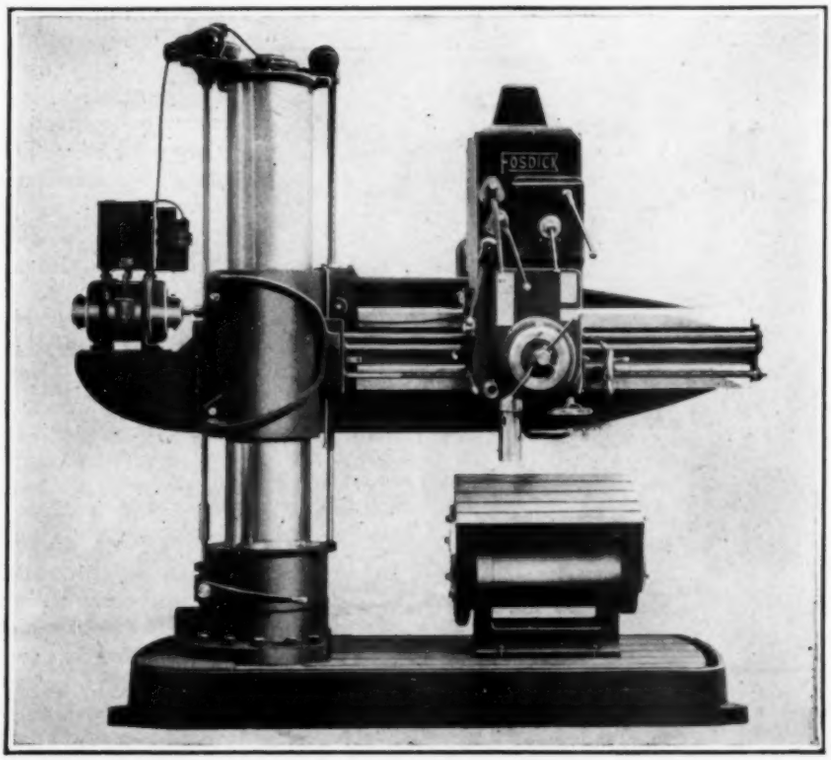
There are a total of eighteen spindle feeds available that are changed by two levers. The feed range is from 0.003 to 0.125 in. per rev., including pipe-tap leads of 8, 11½, and 14 threads per in. Hardened alloy steel is used in the construction of the gears, which are of the sliding type. They are also lubricated automatically by filtered oil. A safety interlock is provided to prevent throwing in heavy feeds at high speeds, and safety-feed knockouts are located at both extremes of the spindle. Even inch gradations are used on the depth-dial which is so arranged that the full travel of the spindle can be made without re-adjusting the depth-dial setting.

A multiple-disk friction controls the quick return of the spindle, and this unit has a single nut adjustment on the outside of the head. An adjustable spring counterbalance is provided on the spindle in order to properly balance heavy tools. A spring-actuated safety catch is incorporated in the spindle to prevent falling in case the counterbalance spring should break. A roller-bearing type of spindle sleeve is used which is lubricated by a high-pressure, hand-operated pump. The spindle is of the multiple-splined type.

Lubrication of the head is obtained by a built-in submerged oil pump, the oil being pumped through a Purolator oil filter and through tubing to the various bearings and then drained to the sump.

Multiple-disk start, stop and reverse frictions are included in the spindle clutch, and each friction unit is adjustable by a nut located on the outside of the case. Multiple-splined shafts with integral keys are used throughout.

A constant-speed motor drives the machine, including the spindle, the vertical operation of the arm, and the horizontal movement of the head. All gears throughout the drive are constructed of hardened alloy steel. The drives from the motor to the



Fosdick Heavy-Duty Radial Drill

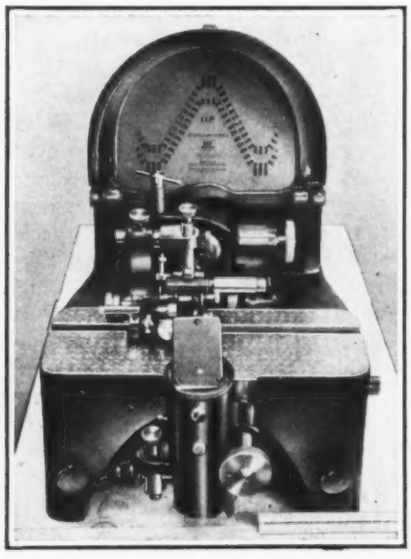
Shop Equipment News

spindle nose are mounted on ball and tapered-roller bearings. Two motor speeds are available, one operating at 1,200 r.p.m. for spindle speeds ranging from 14 to 1,010 r.p.m. and the other at 1,800 r.p.m. for spindle speeds of 20 to 1,406 r.p.m. The machine can be furnished with the motor on the arm or on the base, or arranged for single pulley belt drive.

Universal Stage for Hartness Comparator

The Jones & Lamson Co., Springfield, Vt., has developed a universal stage for the Hartness comparator to accommodate a wide range of diameters and pitches of screws and taps. The apparatus, shown in the illustration, is made up of a frame carrying rolls on which the threads are supported at the pitch line, an adjustable back stop for positioning the screw on top, and a spring plunger for holding the screw down onto the rolls and back against the stop.

The rolls are free to revolve, one being fixed longitudinally in relation to the lens, and the other free to accommodate itself to the thread. With

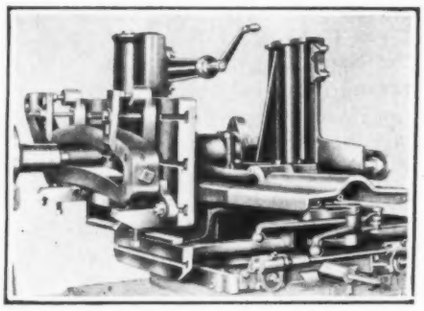


Universal Stage for Hartness Comparator

the adjustments provided, it is possible to test the pitch diameter, lead and form of screws from $\frac{1}{4}$ in. to $1\frac{3}{8}$ in. in diam., and of any pitch from 6 to 28. The advantage claimed for this fixture is that it is universal, thereby doing away with the snap, ring, and lead gages previously required to test a variety of sizes.

Micro Valve Gear Link Grinding Attachment

THE Micro Machine Co., Bettendorf, Iowa, has announced a locomotive valve gear link grinding attachment applicable to the Micro internal grinders, Models B.G. and F.G. The attachment is suitable for grinding the Walschaert, Stevenson, Young and other types of links with



Micro Valve Gear Link Grinding Attachment

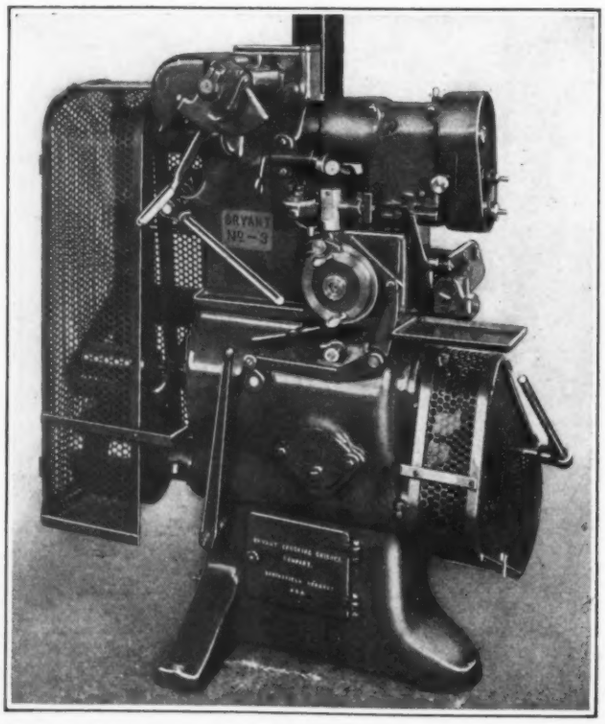
radii within a range of 20 in. to 100 in. The attachment is a self-contained unit which locates in the center T-slot of the work table and has a $\frac{1}{2}$-hp., 1,750 r.p.m. motor. Brackets are furnished for holding the link in position for grinding, and the diamond for dressing the wheel is conveniently located.

The travel of the work platen is governed by adjustable reversing dogs, and the main machine table oscillates slightly to insure uniform wheel wear during the grinding operation. The horizontal slide ways of the fixture are 10 in. wide and $36\frac{1}{2}$ in. long. The total cross travel is 30 in. The work mounting platen is provided with three T-slots and a center hole for mounting the links and blocks. There is also provided a fine vertical adjustment for feeding the wheel to the work. The attachment is supplied with a heavy-duty, ball bearing spindle for holding a wide face wheel. The net weight of the fixture, spindle and accessories is approximately 1,300 pounds.

Bryant No. 3 Semi-Automatic Hole Grinder

In order to provide for the rapid production of holes up to $1\frac{1}{4}$ in. in diam. and 2 in. in length in ball bearing races, small gears, bushings and the like, the No. 3 semi-automatic hole grinder was developed by the Bryant Chucking Grinder Co., Springfield, Vt. The swing of the machine is for work $6\frac{1}{2}$ in. in diam. The machine can be furnished for either belt or motor drive.

As in previous machines made by this company, a suspended wheel slide is incorporated in the design in order to insure rigid and accurate control of the wheel. This slide is manipulated by a single lever operated by the left hand, thus leaving the right hand of the operator free for chucking. The wheel slide can be swung to the rear to give easy access to the work. An indicator is provided for holes $\frac{3}{4}$ in. or larger in sizing work. Among other improvements to the unit are the diamond holder, simplified air valve, larger wheelhead and miscellaneous refinements intended to simplify operation as much as possible.



Bryant No. 3 Semi-Automatic Hole Grinder

NEWS OF THE WEEK

Plan to Organize the First Machine Tool Congress

For some time it has been felt that there was a field for an organization open to men who are interested in discussions of problems of mutual concern to users, distributors, designers and builders of machine tools. Many men interested in those problems are not members of engineering societies, and are unable to attend annual meetings of engineering societies, but they have something to contribute and to receive from discussions in a neutral forum, where the only qualification for membership would be a reasonable interest in machine tools.

Such a forum is now being organized, and will hold its first meeting under the title "Machine Tool Congress" at Cleveland, Ohio, on Sept. 19 to 22. The central topic for discussion at the first meeting will be "Various Phases of Standardization of Machine Tools." Discussions are arranged for dealing with this question, first, from a broad aspect of standardization in general, and its benefit to the industry, presented by Dr. P. G. Agnew, secretary of the American Engineering Standards Committee.

Another discussion will be led by James E. Gleason, president of Gleason Works, Rochester, N. Y., and also president of the National Machine Tool Builders' Association, setting forth the advantages of standardization from the machine tool builder's point of view.

Another discussion will be led by Sol A. Einstein, chief engineer of the Cincinnati Milling Machine Co., Cincinnati, who will discuss the question of standardization from the engineering point of view.

Other sessions of the Congress will be in the nature of round table discussions of specific items concerning machine tools, which would be proper subjects for standardization. As a tentative list of such topics the following have been suggested:

(1) The standardization of initial speeds of machine tools.
(2) The standardization of spindle ends of engine lathes, screw machines and grinding machines. (This to include faceplates and chucks.)
(3) The standardization of belt pull.
(4) The standardization of spline shafts.
(5) Standardization of paint colors and materials for finishing.
(6) The urging of standardization of certain fundamental dimensions of motors, pumps and other purchased units for machine tools.
(7) The discussion of the use of flange motors as compared with the usual motor with feet.
(8) Standardization of handwheels, pulleys, bushings, etc., and in general the question of standardizing of parts as compared with practices.
(9) Discussion of the standardization of working ranges, nomenclature, etc.

Reduced rates on the certificate plan of one and one-half fares for the round trip have been granted by the railroads to those who take membership in this Congress, either before or during the sessions, and who provide themselves with certificates under the usual rules laid down.

The secretary *pro tem* of the Congres is Ernest F. DuBrul, general manager of the National Machine Tool Builders' Association, Provident Bank Bldg., Cincinnati.

Power Transmission Board Offers New Service

Creation of an advisory board of engineers is announced by W. S. Hays, executive secretary of the Power Transmission Association, Drexel Bldg., Philadelphia. Any company that is considering the construction of a new plant or a project of remodeling an old one is at liberty to make use of the service rendered by this advisory board as a consulting body on all problems of mechanical transmission. Questions involving the use of belting, pulleys, shafting, clutches, bearings, chains and speed reduction units, for instance, may be cleared through this group of experts without charge except in those cases where special consulting, design service or traveling is required.

One significant activity of this newly created board will be the preparation of a practical handbook on the subject of mechanical power transmission for the use of manufacturing industries.

William Staniar, chairman of this advisory board of engineers announces that membership of this board already includes: R. W. Drake, International Harvester Co.; E. W. Zimmerman, Brown-Lipe-Chapin Co.; J. H. Damon, Plymouth Cordage Co.; F. G. Cobb, The Arkwrights, Inc.; W. B. Wood, Joseph Bancroft & Sons Co.; D. A. Hampson, Middletown, N.Y.; K. D. Hamilton, Brockton, Mass.; W. F. Schaphorst, Newark, N.J.; E. R. Stall, J. E. Sirrine & Co., Textile Shoe Machinery Corporation, D. L. Trax, Gypsy Oil Co.; W. C. Beckford, American Light and Traction Co.

Heald Acquires Control of Giddings & Lewis Grinding Machines

The Heald Machine Co., of Worcester, Mass., has acquired the grinding machine interests of the Giddings & Lewis Machine Tool Co., of Fond du Lac, Wis. The purchase included all the assets of the grinding machine division of the Giddings & Lewis Machine Tool Co., including drawings, patterns, jigs, tools and fixtures, inventory of machines and parts, patent rights and good will.

The Heald Machine Co., one of the oldest manufacturers of internal grinding machines, will now be in a position to offer a complete line of internal grinders, the "Teromatic," the "Size-Matic" and the "Duplex" automatic machines and various styles and sizes of gear-driven and hydraulic machines for any kind of work.

The "Teromatic," which is the leader of the G & L grinding machine line, is an automatic internal grinding machine and has been on the market nearly five years.

The positive gaging principle of this machine was invented and patented by J. G. McDonough, of Eau Claire, Wis., Giddings & Lewis manufacturing the machines under an exclusive license. All of the basic and supplementary patent rights, both of Mr. McDonough and Giddings & Lewis, have been obtained by the Heald company and these combined with the patents issued and pending to Heald in connection with their previous independent development of automatic internal grinders will enable Heald to offer the trade excellent patent protection. The "Teromatic" and other internal grinding machines, together with Heald rotary surface grinders and cylinder grinders will be manufactured at the plant in Worcester.

For the time being, distribution of the "Teromatic" will be continued through the machine tool dealer organization which has previously handled this machine, but in the near future will be taken care of by the branch offices of the Heald Machine Co. in New York, Chicago, Detroit, Cleveland, Cincinnati, Philadelphia, Syracuse, and Worcester, and the Heald exclusive agents in this country and abroad.

The Giddings & Lewis Machine Tool Co. will now be in a position to devote its entire efforts to the manufacture and development of precision horizontal boring, drilling and milling machines which it will build at the plant in Fond du Lac.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

(Copyrighted, Theodore H. Price Publishing Corporation, 16 Exchange Place, New York)

THE summer breezes are light and the "Ship of Business" is almost on an even keel as she sails a comparatively smooth sea. She is not moving quite as swiftly as at this time last year, but there are no dark clouds in sight, and it may be that she will gather speed when the trade winds of the autumn commence to be felt.

Just at present her navigating officers are debating whether prosperity is best subserved by large crops sold at low prices or small crops sold at high prices. It is a question concerning which there is much room for discussion, and the answer is probably to be found mid-way between the extremes. Mammoth crops sold for little or nothing would spell disaster, just as a complete crop failure with very high prices for the production salvaged would also work ruin.

But neither alternative confronts us. The yield of grain in the United States is a poor one, but it is fairly good elsewhere, and our domestic crop now promises to be larger than had been anticipated some weeks ago. Wheat and corn are, in consequence, somewhat lower.

The less important crops, such as potatoes, fruit, and vegetables, are upon the whole satisfactory, and it is believed that they will be salable at fair prices. Upon this belief and the expectation that the farmers will have some money to spend this fall, the stock market has been quietly steady. Some securities have advanced, but others have declined, and the average is not much changed.

Money continues in abundant supply, but the fact that stock brokers' loans show only a small decrease acts as a deterrent to would-be buyers on margin. The speculation on margin is, however, a less important factor than it used to be. So many great fortunes have been made during the last ten or twelve years that there are lots of men who are constant investors of their surplus income.

Directly and indirectly, the automobile industry is responsible for many of these great fortunes, but public utilities, commercial chemistry, advertising, and the remarkable rise in some railroad stocks have all helped to swell the Army of Opulence whose rank and file can buy and pay for anything that takes their fancy.

It is the absorbent power of this group of multi-millionaires that has supported the stock market for more than a year now, and may continue to support it for some time yet, in the face of the trade reaction that is plainly revealed by all the available statistics, including the reports of car loadings, the railroad passenger traffic, automobile production, new building, unemployment, and most other data except those relative to chain store sales and the use of electricity.

WHAT'S DOING IN INDUSTRY

THE PROXIMITY of a series of expositions, at which leading manufacturers of machinery and machine tools will show their latest improvements in design, has had the effect of holding up decisions on many orders that should have been placed in August. It is known for a fact that many purchasing agents and mechanical executives are deferring final confirmation of pending orders until they have personally inspected the tools to be shown at New Haven, Detroit and Cleveland.

SLIGHT flurries have been felt in Detroit and increased production schedules of some motor car manufacturers forecast a call for more equipment. Cincinnati reports improved demand and scattered purchases by general users of machine tools. Industrial demand helps keep a satisfactory volume in Milwaukee.

NEW YORK sales are holding up well, many dealers reporting an August volume ahead of that of July. Automotive and railroad prospects are bright for manufacturers and dealers in Philadelphia. New England is waiting for the show which opens next week, and sales will amount to little until after then. No signs of a boom are visible in Buffalo, but small orders are prevalent.

BUSINESS on the whole is not moving as swiftly as at this time last year, but there are no dark clouds in sight and greater activity is looked for when the trade winds of autumn commence to be felt.

Whether the reaction will be arrested when the farmer gets the money that will be paid to him for this year's crops is the question, and the history of next year's business will be largely dependent upon the answer that is made to it by the events of the autumn.

That merchants are in some doubt as to what this answer will be is shown by the small orders that are being placed for both cotton and woolen textiles as well as by the relative inactivity of the steel industry and a further decline in the price of copper.

The poor demand for refined sugar in the face of quite a sharp advance for Cuban raws is another straw that shows how the current of distribution is being slowed by caution, and the gradual decline in coffee may be similarly interpreted, although it is primarily due to the fear that Brazil may be unable to impound and hold the large supply that is in prospect.

Nothing has happened in Europe that should have a reflex in America. In Lancashire, there is some complaint over the rise in cotton, and a serious decrease in consumption is predicted. This is natural, for it is not to be expected that the world will use so much cotton at a shilling as it did at sixpence.

On the Continent, the politicians appear to have taken a holiday, but the industrialists seem to be busy, with those of Germany in the lead. Some improvement in economic conditions in the Argentine is chronicled in the news dispatches.

But all this is *obiter* and is only included in a review of economic happenings because the world now is so interrelated that "the welfare of one is the concern of all." This is emphasized by the stimulating effect that the reduction in our Federal Reserve rate has had upon commerce overseas, and from now on, the tides of business on both sides of the Atlantic ought to move in closer accord than before the war. Our interests and our investments abroad have become enormous. Our tourists spend nearly a billion dollars a year outside our own boundaries, and having become international in fact it behooves us to keep a watchful eye upon developments in the countries that provide us with a market for our surplus production and our surplus capital.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

BUFFALO

The machine tool trade in Buffalo has not yet shown very definite signs of recuperating from the doldrums of summer inactivity. There are some indications reported by some dealers that the autumn will produce some good business. In some cases inquiries are beginning to come in for equipment for delivery later in the year.

In the electrical field the activity is only in line with that of the machine tool field. There continues to be a fairly good run of small orders, but few if any really big orders are in sight for delivery during the balance of the year. It is expected that the first half of September will indicate quite clearly just what the fall business is likely to be.

The demand for contractors' equipment is quiet and a difficult price situation still prevails in that field.

NEW YORK

The total volume of business closed by dealers and manufacturers' agents in this territory during the month of August was in most cases ahead of the volume for July. General industrial users were the leading buyers, little equipment going to the railroads or to the automobile industry. One or two large orders helped to furnish cause for optimism and to inspire predictions that some good business will be placed during September.

Salesmen covering this market state that the proximity of the New Haven, Cleveland and Detroit machine tool expositions has affected buying to a great extent. Many executives and purchasing agents have put off the comfirmation of orders for tools until they have inspected the latest models to be shown at the above cities.

The used tool market is fairly active, certain types of standard tools being moved at prices considered to be reasonable. Cranes, hoists and material handling equipment is in better demand since the building of new plants or extensions has been completed.

MILWAUKEE

Despite the fact that the sales curve is more or less choppy and an upward trend has not yet developed, sentiment in the metal working equipment industry is favorable and the trade looks for a substantial improvement within the next three to four weeks. At present, trade bears the strong imprint of midsummer fatigue, but enough business is being booked to enable manufacturers to sustain output at a moderate rate.

The automobile shops are furnishing improved inquiry, but action is rather slow. When the situation clears, particularly with respect to the future of the Ford Motor Co., it is confidently believed that buying will be more general. Replacement business coming from the automobile industry amounts to a considerable total, but as yet there seems to be no disposition to acquire new equipment in quantity, existing capacity apparently sufficing for present requirements of production. Retail sales are surprisingly good for the season and fully equal to a year ago in this territory.

General industrial demand continues to be the main factor sustaining the tool market. Foundries and machine shops report an improved demand, although orders are largely for immediate shipment, and the usual long dating is absent. There seems to be no question that the general feeling in business is better than it has been for at least six months, and nothing is appearing on the horizon to demoralize sentiment in favor of an active fall and winter.

NEW ENGLAND

The machinery exposition at Yale University, New Haven, during the coming week is expected to attract attendance of prospective buyers of machinery who have been awaiting new tools which are expected to be shown at this exhibition. Anticipations incidental to the exposition were topics discussed freely by manufacturers. A fair volume of business remains to be closed at the exposition.

Production has gone ahead at a fairly satisfactory rate during the past ten days. Estimates made by manufacturers of production equipment place the volume this year at 7 per cent in excess of a year ago at this time. Small tool manufacturers' estimates of output give the average of 12 per cent over a year ago. Hand tool volume is slightly lower than a year ago. Export trade so far this year is about 15 per cent better than a year ago.

PHILADELPHIA

While business in the machinery and machine tool markets continued dull in this area during the last two weeks, a note of hopeful anticipation for the early future was sounded by some representatives in the trade. Selling agents who have made a survey of the territory as far South as Norfolk and West to Altoona have reason to believe that Southern railroads will soon be in the market for large purchases. Reports that some lists are now in process of formation have been received.

During the last two weeks some inquiries have come from automotive centers to concerns dealing in abrasives. These are regarded as indicative of early buying. The inquiries were the basis of a hopeful feeling among the leaders of the trade.

There was a falling off in business transacted in the first part of August compared to the corresponding period of last year. Some dealers attributed that situation to the Cleveland show, which, attended by purchasing representatives, has caused them to defer buying until their examination of the Cleveland displays.

DETROIT

A few flurries of accidental business characterized the machinery market in Detroit last week. There have been many substantial orders to a small number of dealers but the market is still a long way from being good. Dealers who have succeeded in getting business this month agree that their orders do not indicate a change in the market.

For most dealers and for most of the tool shops, the current month is little better than the two preceding months, except for an increase in the number of inquiries. There is still a general feeling of hopefulness for the future and in most quarters it is felt that the year will be a successful one.

Ford, Chevrolet, Dodge, Oakland and Pontiac plants have all made substantial purchases within the past week or ten days. Dodge has been perhaps the biggest buyer of any, having made large additions to its equipment in preparation for the production of the new light-six model. Oakland is planning to double production. The plant is now turning out 500 cars a day. The Pontiac plant is also planning to raise its production to a thousand a day. The threat of the new Ford car has caused several of the larger automobile companies to introduce improvements.

Municipal buying in Michigan has served to maintain the market for power equipment. Employment in Detroit improved slightly in the past ten days.

CINCINNATI

In the opinion of many machine tool manufacturers and selling agents in the Cincinnati district, a number of prospective buyers are deferring the placing of orders until after they have been to the Cleveland exhibit. While the demand improved a small amount in the past week, the majority of concerns in the industry report that business was rather sluggish. However, there were two or three exceptions.

The sustaining feature of the market was orders for single tools and replacements, these being well distributed over the various sections of the country. The principal buyers were general machinists and miscellaneous users. One good-sized order for lathes was received from Canada, and another similar order came from Italy. Railroads made a few scattering purchases of single tools and replacements and a few single orders came from concerns in the automotive industry.

The majority of manufacturers and selling agents report the receipt of an increased number of inquiries during the week. Some came from foreign markets. All concerns report that there is a big volume of business pending, and the opinion is that orders will begin to arrive soon after the Cleveland exhibit.

Transmission Safety Code

The National Bureau of Casualty and Surety Underwriters, the International Association of Industrial Accident Boards and Commissions and the American Society of Mechanical Engineers have presented to the American Engineering Standards Committee the revised "Safety Code for Mechanical Power Transmission Apparatus" for approval as an American standard. The original code was approved by the A.E.S.C. in July, 1923, as a tentative American standard. Three years later at the meeting of the Safety Code Correlating Committee the code was recommended for advancement to the status of an American standard when revised and submitted to the A.E.S.C. for approval. The revision of the code has the approval of the sectional committee, organized in February, 1921, now numbering twenty-four members.

Machinery Plays Unimportant Part in German Reparations Payments

Raw materials and semi-finished products lead

By Our Berlin Correspondent

WHEN people speak of the German reparations tribute they are thinking as a rule of a few commodities only, coal and coke, dyes and perhaps a limited number of industrial products. Recently the German Bureau of Statistics included the reparations supply in the export returns, and this provides for the first time a clear insight into its volume and constitution.

The results are truly astonishing. There is hardly a group of merchandise which does not share in the reparations supply, and in many groups it figures quite prominently. The chief beneficiaries of the reparations supply are France and Belgium, but the list of countries which draw from it includes also Italy, Greece, Poland, Jugoslavia, Japan, Portugal, Portuguese colonies, Algeria, French Indies and Roumania.

The total of the reparations supply in the period January-June 1927 amounted to 257 million marks, or about 6 per cent of the German export. Raw material and semi-products have the largest share. The latter amounted to 175 million marks, which is 17 per cent of the export of that class of goods.

The list of reparations supply comprises 393 different subdivisions out of 935 specified in the German export statistics. The missing items are chiefly found under the headings "food stuffs" and "textiles," while in the list of manufactured goods there are very few vacancies. The total of such products was in the first half of 1927 only 75 million marks out of an export of 3,483 millions, but it can be seen that it is growing constantly in proportion to the formalities, coincident with this sort of supply becoming routine.

The following articles figure most prominently in the reparations supply: Building and mining timber, telegraph poles, railroad sleepers, sugar, coal, clay, paper, ceramic products, chemicals, raw and refined, dyes, iron and steel products, hardware, tools, agricultural implements, machinery, electric goods and railroad rolling stock. Motor vehicles are conspicuously absent.

The machinery exported by way of reparations supply amounted in the first six months of 1927 to 14,479 tons, valued at 18,783,000 marks. This amount is not large and constitutes only about 5 per cent of the total export, but it is visibly increasing from year to year. It is also gaining in variety as can be seen from the fact that of the seventy-five different items into which machinery is subdivided in the German export statistics, sixty-five are represented in the reparations supply. Only the following are missing: Steam rollers, tractors, hydraulic turbines, motors for motor vehicles, compressors, dredges, one or two classes of textile machines, ploughs, rock drills, and machines for breweries. What this signifies is clear. The reparations supply strongly discriminates as regards quality.

The following tabulation gives a specified list of machinery shipped by way of reparations supply in the period January to June, 1927:

	Metric Tons	Value in Marks
Railroad engines	6,604	7,858,000
Steam engines and turbines	82	282,000
Combustion motors	104	257,000
Cranes	48	31,000
Power units of various kinds	120	279,000
Textile machinery	1,352	2,553,000
Metal working machine tools	2,247	2,754,000
Agricultural machinery	681	813,000
Grain mills	583	1,082,000
Refrigerators	158	164,000
Hoisting machinery	316	486,000
Ore dressing machinery	216	336,000
Printing presses	59	305,000

The procedure for purchases on reparations account has been greatly simplified. The claim holder buys in the open market, just like any other buyer, but payment to the manufacturer is made by the German State Treasury. At first quite an aversion could be noted with German manufacturers against orders on reparations account, but this has now subsided. The holder of a reparations claim gets the same service as a cash buyer, sometimes even a better one, as the German manufacturers noticed in the course of time that goods shipped on reparations account frequently opened the way to even larger cash orders. This is the silver lining of the problem. It greatly mollifies the rankling thought so frequently expressed in Germany of "all the good stuff given away for nothing," and affords the consolation that this stuff often acts as pioneer to German manufacture and carries a solid amount of good business in its wake.

Factory Work in France Accused of Spreading Tuberculosis

Recent discussion in the French Chamber of Deputies bore upon the spread of tuberculosis as a direct result of low salaries, mass production and other influences of the modern industrial pace. The argument is only interesting by reason of the suggestion that it presents as against advancement in manufacturing processes in France.

Deputy Clamamus stated that tuberculosis was constantly increasing in industrial centers in France and was less frequently to be observed in the well-off quarters of Paris than elsewhere in the capital. Up to this point his observations were general.

He stated specifically that the factory was a "hell" and that it was there that tuberculosis was contracted by both men and women workers. His further argument was for a higher salary for men so that women might remain at home. He mentioned also the ravages among young factory workers of from 13 to 18 years of age. The law on workingmen's dwellings, he declared, was inoperative. He denounced low salaries and rationalization methods as being the prime causes of the spread of tuberculosis among industrial workers.

Deputy Borrel stated in reply that in America it was precisely because of rationalization that salaries were at the high level where they now stand and that the workers are in a situation relatively superior to those of any other country, and that tuberculosis was in diminution.

Patent Regulations in Ireland

By Dr. Alfred Müller
International Patent Attorney

The Patents, Designs and Trademarks Act of the Irish Free State (known as the "Industrial and Commercial Property Act of 1927"), has been passed and will become effective on October first.

This law has been modelled largely after the British Patents Act, most of the important regulatory features being similar. A special provision of the Free State act, however, concerns the validity of patents issued under the British act before the Irish law came into effect. Section 29 of the new Irish law provides that every British patent granted prior to the commencement of the Irish Free State law shall be considered a patent granted under the latter act, and shall have the same force and effect as the said patent has in Great Britain.

Another section provides that where the time for sealing a British patent has not expired at the commencement of the Irish Free State Act, the applicant shall have during the time between acceptance and sealing, the same privileges and rights in Saorstat Eireann as if the patent had been granted to him there, except that he cannot sue for infringement until the patent has actually been granted. The holder of a patent under the Free State Act shall not be entitled to any other patent under said act for the invention "for which such first mentioned patent was granted."

It is evident that the holder of a British patent granted prior to the passing of the Irish Free State Law, or the applicant having a patent granted on an application still pending in the British Patent Office, will be fully protected in the Irish Free State regarding the invention covered by his British patent or the pending application.

Personals

R. H. McGREDY has been appointed sales manager of the Lo-Hed hoist division of the American Engineering Co., Philadelphia.

JOHN F. KELLER, of the engineering extension department of Purdue University, has received a leave of absence until the first of the year to become director of the extension division of the American Society for Steel Treating, with offices in Cleveland.

CARL E. JOHNSON, vice-president of the U. S. Electrical Manufacturing Co., and president of the U. S. Industries, Inc., of Los Angeles, has resigned and disposed of his entire holdings in both companies. Mr. Johnson has been intimately identified with the electrical manufacturing industry in southern California for over twenty years.

FRANCIS HODGKINSON, consulting mechanical engineer at the South Philadelphia Works of the Westinghouse Electric and Manufacturing Co., has sailed for Europe. Mr. Hodgkinson plans an extensive business trip in Europe, and while in Italy he will attend the sessions of the International Electric Technical Commission, of which he is a member.

H. C. ATKINS, president of E. C. Atkins & Co., Indianapolis, saw manufacturers, will be one of four Indiana business men who will represent the state on the platform committee of American industry, which will draw up national planks to be submitted both to the Republican and Democratic parties at their conventions next year.

F. M. YOUNG, former vice-president and general manager of the Racine Radiator Co., has organized and been elected president of the Young Radiator Co. of Racine, Wis., which will manufacture heavy-duty radiators, including bus, truck, tractor, power unit and various industrial types. Associated with Mr. Young in this new enterprise is the factory management personnel and engineering staff which assisted him during the last several years.

LARS G. NILSON has resigned as chief engineer of the Nilson-Miller Corporation, of Hoboken, N. J., to enter consulting engineering practice. Mr. Nilson, who has been active in the Nilson-Miller Corporation for the past eighteen years, will still serve that company as a consultant, and retains his interest as director and stockholder. In his consulting practice he will devote his attention to the design and development of special machinery and devices. Mr. Nilson's address is 1219 Garden St., Hoboken, N. J.

Business Items

The Cutler-Hammer Manufacturing Co., of Milwaukee, announces the removal of its Cleveland office from the Guardian Trust Bldg., to the Guarantee Title Bldg.

Fire, believed to have been started from sparks from a machine, resulted in the loss of the entire smelting plant at the Indiana Smelting and Refining Co., in Indianapolis.

The Maisch Tool and Manufacturing Co., 1519 N. Artesian Ave., Chicago, has been organized. The company will manufacture and deal in tools, machinery, dies and metal equipment. Incorporators are H. W. Maisch, Oliver Maisch and Fred Wagner, Jr.

The Water Tube Boiler and Tank Co., 7323 Woodlawn Ave., Chicago, has been incorporated to manufacture and deal in machinery, tools and equipment of all kinds. Incorporators are: Harry L. Madorin, J. Abraham, G. Kirchoff, E. C. Knight and J. G. Taylor.

The Lampman Tool Co., of Angola, Ind., expects to have its plant moved to Huntington and in operation early this month. A new factory building is being completed to house the plant in Huntington.

The plant of the General Electric Co., at Decatur, Ind., which has been shut down for some time because of over-production, has been reopened with a full force of employees.

The Russel, Burdsall & Ward Bolt and Nut Co., of Port Chester, N. Y., announces plans for the construction of a steel products plant at Corapolis, Pa., on the Pittsburgh & Lake Erie R.R. Estimates place the cost of this plant at $3,500,000.

A proposal for the merger of the Farrel Foundry and Machine Co., of Ansonia, Conn., and the Birmingham Iron Foundry, of Derby, Conn., has been sent to stockholders of both companies. A joint meeting late this month will vote on the combination.

Directors of the Brown Hoisting Machinery Co., of Cleveland, and of the Industrial Works, of Bay City, Mich., have approved the proposed merger of the two companies. Ratification of the merger is expected soon by the stockholders. The combined organization will be known as the Industrial Brown Hoist Corporation.

Articles of incorporation have been filed with the secretary of state in Indianapolis by the Romach Co., of Indianapolis. The corporation has an initial capital stock of $10,000 and is formed to do a general foundry business. The incorporators are Elwood W. Rother, E. H. Kemper McComb and Robert D. Coleman.

The New Home Sewing Machine Co., Orange, Mass., is formulating plans for complete reorganization. Fred Bender, of New York, has been elected president of the new organization. Mr. Bender is vice-president and general manager of the Metropolitan Sewing Machine Corporation, of Nyack, N. Y.

Articles of incorporation for General Fiber Products, Inc., filed recently, are the first steps in a reorganization of the Rockwood Manufacturing Co., of Indianapolis, manufacturer of pulleys and transmission mechanisms. According to the preliminary plans, the new company will take over the Rockwood company's plant and business and the same executives will retain control.

The Whitman-Barnes-Detroit Corporation announces the following changes in its personnel: M. B. Snow has resigned as vice-president and director and has been succeeded by Karl Kendig, who is also treasurer; H. Z. Callander, sales manager, has been made secretary and sales manager; Thomas S. Poole has been appointed direct factory representative for the Southern states, succeeding Fred A. Hardin, who resigned.

The Fafnir Bearing Co., New Britain, Conn., is soon to start manufacturing a ball bearing spring shackle for automobiles. The device was designed and patented by Raymond H. Searles, vice-president of the company. It is now undergoing tests by several automobile manufacturing companies. As soon as patterns, machinery and tools are perfected and the tests approved, manufacturing will start in volume.

The General Burners Corporation, organized recently to manufacture oil-burning equipment, has announced the acquisition of the plant of J. E. Snyder & Son, Worcester, Mass. The latter company will continue the manufacture of upright drills in the plant for an indefinite period, but it is planned to alter and equip the factory for the manufacture of oil burners. John T. Lord is president and general manager of the General Burners Corporation.

The Oswego Tool Co., manufacturer of vises, cutters and screw punches, of Oswego, N. Y., announces that controlling interest in the company has been acquired by W. J. Henry, of Auburn, N. Y. Mr. Henry is president of the Henry Forge and Tool Co., and of the Crouse & Pope Foundry Corporation. New officers of the Oswego company are: W. J. Henry, president; W. M. Henry, vice-president; George H. Cleaver, secretary. E. W. Fulton, for several years works manager, has been made sales manager.

The Paragon-Keyless Lock Co., recently incorporated in Indiana, is locating at Elkhart, Ind. The officers of the new company are F. E. Biddle, president, and E. H. Johnson, secretary and treasurer. Mr. Biddle is inventor and patentee of a keyless door lock for residences. Machinery is being installed in the plant and tools and dies are being made for the manufacture. It is expected production will start about Sept. 15. Both men now operate a machine and tool plant in Elkhart under the firm name of Johnson & Biddle.

Announcement has been made of the reorganization of the Utilitor Corporation, manufacturer of small tractors, in Indianapolis. The company has obtained part of the plant of the old Midwest Engine Co. Patent rights to the tractor are held by the stockholders of the corporation, who have purchased them from the receiver of the Midwest Engine Co. The new company is owned by O. W. Armstrong, J. D. Hardesty and C. W. Carter, all of Seymour; and Ben R. Inman of Plainfield, Ind., the latter being chairman of the board of directors.

Forthcoming Meetings

Steel and Power Show. First Steel and Power Show in the Varsity Arena, Toronto, Canada, sponsored by the Montreal and Toronto Chapters of the American Society for Steel Treating; by the Canada, Toronto and Hamilton Councils of the Universal Craftsmen's Council of Engineers; by the Engineers' Mutual Benefit Fund; the American Electroplaters' Society; and the Canadian section of the American Welding Society. Aug. 31 to Sept. 2. General chairman, C. Bradshaw, 153 University Ave., Toronto, Canada.

American Railway Tool Foremen's Association. Fifteenth annual meeting, Hotel Sherman, Chicago, Aug. 31, Sept. 1 and 2. G. G. Macina, secretary, 11,402 Calumet Ave., Chicago.

Machine Tool Exhibit. Seventh annual machine tool exhibition under the auspices of the New Haven Section of the American Society of Mechanical Engineers, the Department of Mechanical Engineering of Sheffield Scientific School, Yale University, and the Chamber of Commerce of New Haven: At the Mason Laboratory, Yale University, Sept. 6 to 9. Harry R. Westcott, chairman of the exhibit committee, 400 Temple St., New Haven, Conn.

American Society for Steel Treating. Ninth annual convention and national steel exposition, Detroit, week of Sept. 19. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

Society of Automotive Engineers. Production Meeting, starting at Hotel Winton, Cleveland, Sept. 19 and 20; continuing at Hotel Statler, Detroit, Sept. 21 and 22. C. E. Heywood, manager of meetings, 29 West 39th St., New York City.

American Welding Society. Fall meeting, Book-Cadillac Hotel, Detroit, Sept. 19 to 23. M. M. Kelly, secretary, 29 West 39th St., New York City.

Institute of Metals. Sectional meeting, Hotel Statler, Detroit, Sept. 19 to 23. H. Foster Bain, general secretary, 29 West 39th St., New York City.

National Steel and Machine Tool Exposition. Under the auspices of the American Society for Steel Treating. Convention Hall, Detroit, Sept. 19 to 23. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Machine Tool Builders' Exposition. First annual machine tool exposition, conducted by the National Machine Tool Builders' Association, at the West Annex of the Public Auditorium, Cleveland, Ohio, Sept. 19 to 24. J. Wallace Carrel, vice-president and general manager, the Lodge & Shipley Machine Tool Co., Cincinnati, chairman of the exposition committee. Roberts Everett, manager of the exposition, Pennsylvania Bldg., New York. Ernest F. DuBrul, general manager of the association, 826 Provident Bank Building, Cincinnati, Ohio.

American Gear Manufacturers Association. Fall meeting, Mount Royal Hotel, Montreal, Canada, Oct. 20, 21 and 22. T. W. Owen, secretary, 2443 Prospect St., Cleveland, Ohio.

American Institute of Steel Construction. Annual convention at Pinehurst, North Carolina, Oct. 25 to 29. Charles F. Abbott, executive director, 285 Madison Ave., New York City.

National Association of Manufacturers. Annual convention, Read House, Chattanooga, Tenn., Oct. 25, 26 and 27. George S. Doudinot, secretary, 50 Church St., New York City.

American Society of Mechanical Engineers. National management meeting, Rochester, N. Y., Oct. 26-27. Charles W. Lytle, chairman, Management Div., 29 W. 39th St., New York City.

National Founders Association. Convention, Hotel Astor, New York, N. Y., Nov. 16-17. J. M. Taylor, secretary, 22 S. La Salle St., Chicago.

National Exposition of Power and Mechanical Engineering. Sixth annual event in the Grand Central Palace, New York, Dec. 5 to 10. Charles F. Roth, manager, Grand Central Palace, New York City.

The Weekly Price Guide

Rise and Fall of the Market

PIG iron shipments are increasing, but volume is small, with prices unchanged. In fact, buying gradually at present is mainly in small lots. This is true for the non-ferrous metals markets as well as for the iron and steel, and show little change in price.

(All prices as of Aug. 29)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$21.44
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	25.62
BIRMINGHAM	
No. 2 Foundry	17.75
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	21.76
Virginia No. 2	27.17
Basic	21.26
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	22.80
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.26
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.25	3.50	3.25	3.89
No. 12	2.30	3.55	3.30	3.94
No. 14	2.35	3.60	3.35	3.99
No. 16	2.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.80	3.75	3.55	4.00
No. 22	2.95	3.90	3.70	4.15
No. 24	3.00	3.95	3.75	4.20
No. 26	3.10	4.05	3.85	4.30
No. 28	3.25	4.20	4.00	4.45
Galvanized				
No. 10	3.15	4.10	3.95	4.25
Nos. 12 to 14	3.25	4.20	4.05	4.35
No. 16	3.35	4.30	4.15	4.45
No. 18	3.50	4.45	4.30	4.60
No. 20	3.65	4.60	4.45	4.75
No. 22	3.70	4.65	4.50	4.80
No. 24	3.85	4.80	4.65	4.95
No. 26	4.05	5.05	4.90	5.20
No. 28	4.30	5.30	5.15	5.45

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv
1 to 3 in. steel butt welded.	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded.	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft. or 100 lb.:

Thickness — Decimal	B.w.g. and Fractions	Outside Diameter in Inches — ⅛	¼	⅜	½	⅝	1	1¼	1½
		Price per Foot							
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23	
.049"	18	.17	.18	.19	.20	.21	.23	.25	
.065"	16	.19	.20	.21	.22	.23	.25	.27	
.083"	14	.20	.22	.23	.24	.25	.27	.29	
.095"	13	.21	.23	.25	.26	.27	.29	.31	
.109"	12	.22	.24	.26	.27	.28	.30	.32	
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33	
.134"	10	.24	.26	.28	.29	.30	.32	.34	

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel, light*	4.50	....	4.65
Spring steel, heavier	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn, round and hex.†	4.00	3.65	3.60
Cold drawn, flats and squares	4.50	4.15	4.10
Structural shapes (base)	3.34	3.00	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.65	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.75 at mill)	3.24	3.00	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, 3/32, 8.35c.; ⅛, 7.85c.; 5/32 to ½, 7.35c. per lb. *Flat, 3/16@½-in. thick. †Shafting and screw stock.

METALS

Current Warehouse Prices in Cents Per Pound for Small Lots

Copper, electrolytic, up to carlots, New York 14.50
Tin, pigs, 5-ton lots, New York ..... 63.50@63.75
Lead, pigs, up to carlots, E. St. Louis 6.45 New York 7.85@8.00
Zinc, slabs, up to carlots, E. St. Louis 6.40 New York ... 7.37½

	New York	Cleveland	Chicago
Antimony, slabs, ton spot	12.00	.....	13.00
Copper sheets, base	22.00	22.00	22.00
Copper wire, base	18.75	18.75	15.25*
Copper bars, base	21.50	21.50	21.50
Copper tubing, base	23.75	24.62½	24.00
Brass sheets, high, base	18.25	18.25	18.25
Brass tubing, high, base	23.12½	23.12½	23.12½
Brass rods, high, base	16.00	16.00	16.00
Brass wire, high, base	18.75	18.75	18.75

*Mill

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26.02
Zinc sheets (casks)	11.00	11.55	10.11
Solder (½ and ½), (case lots)	40.00	40.50	38½@42½

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	83.00
Commercial genuine, intermediate grade	61.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	13.00

Nickel, f.o.b. refinery, cents per lb.:
Ingots..... 35.00 Electrolytic.. 39.00 Shot.....36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Full finished nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	45.00
Cold drawn rods, Grade "A" (base)	53.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	28.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Full finished sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11 62½@11.87½	10.75	10.25@10.75
Copper, heavy, and wire	10 87½@11.37½	10.75	10.00@10.50
Copper, light, and bottoms	11 00 @11.25	9.25	9.00@ 9.50
Heavy lead	5.50 @ 6.00	5.75	5.00@ 5.50
Tea lead	4.50 @ 4.75	3.75	4.00@ 4.50
Brass, heavy, yellow	7.25 @ 7.50	7.00	6.75@ 7.25
Brass, heavy, red	9.00 @ 9.50	9.50	9.00@ 9.50
Brass, light	5.50 @ 6.00	6.00	6.00@ 6.50
No. 1 yellow rod turnings	7.50 @ 8.00	7.00	7.00@ 7.50
Zinc	3.75 @ 4.00	3.25	3.00@ 3.50

TIN PLATES—Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9.50
	Coke Plates—Primes—Per box			
100-lb.,	14x20	6.45	6.10	7.00
	Terne Plates—Small lots, 8-lb. Coating—Per box			
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.15½	36.00 per M	.15
Sal soda, per lb	.03¾	.02	.02¾
Roll sulphur, per lb	.027	.03½	.04
Linseed oil, raw, per 7½-lb. gal., 5 bbl. lots	.86¼	.91	.83½
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	.65	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	.27	.35	.29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	30–10–5%
Heavy grade	30–10%	30–10%	30%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–10%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb.	.16	.1525	.1712½
Solder (½ and ½)	per lb.	.40	.39	.4062½
Cotton waste, white	per lb.	.10@13½	.10@.13½	.13@.17½
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	.65	.65	.55
Machine oil	per gal.	27	.27	.35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in., full kegs	off list	50%*	50%*	40%

*New list April 1, 1927.

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—Standard grade, in sheets 9x11 in., No. 1, per ream of 480 sheets:			
*Flint paper	$5.13	$4.95	$5.13
*Emery paper	10.71	9.15	10.71
*Emery cloth	27.84	27.85	27.84
Emery disks, 6 in. dia., No. 1, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton		Connellsville, 3.00@3.25	
Coke, prompt foundry, per net ton		Connellsville, 4.25@4.75	
White lead, dry or in oil,	100 lb. kegs	..... New York, 13.75	
Red lead, dry,	100 lb. kegs	..... New York, 13.75	
Red lead, in oil,	100 lb. kegs	..... New York, 15.25	

*4½ reams and under.

SHOP SUPPLIES

Discounts from new list dated Apr. 1, 1927, applying on immediate deliveries from warehouse stocks in New York and vicinity:

	Broken Kegs or Cases	Full Kegs or Cases
Machine bolts, square heads and nuts:		
Up to ¾ x 6-in	50%	50–10%
Larger up to 1 x 30-in	45%	50%
1⅛ and 1¼ in. dia	30%	35%
Carriage bolts:		
Up to ½ x 6-in	50–10%	.....
Larger sizes	50%	.....
Coach and lag screws:		
Up to ½ x 6-in	50–10%	.....
Larger sizes	50%	.....
Tap bolts, hexagonal heads	45%	.....
Nuts:		
Hot pressed, square and hexagonal, blank or tapped	45%	50–10%
Cold punched, square and hexagonal, blank or tapped	45%	50–10%
Semi-finished, hexagonal, tapped, in packages	40%	.....
Case hardened, hexagonal, tapped, in packages	30%	.....
Washers: Deduct from list, per 100 lb	$1.50	$3.50
Rivets, button and cone head:		
Small, including ⅞-in. dia	.....	50–10%
Large (base) per 100 lb	$6.50	$5.00

EXTRA per 100 lb. on rivets: For ¼-in. dia., 35c.; ⅜-in., 15c.; 1-in., 5c.; length 1-in. and shorter, 25c.; longer than 1-in. up to and including 1 ⅛-in., 15c.; longer than 5-in., 25c.; standard countersunk head, 25c.

Machine Requirements and Industrial Construction

Equipment Wanted

Fla., Jacksonville — The Aetna Iron & Steel Co., P. O. Box 3386—motor driven bending roll, 48 x ½ in. plate capacity, rolls to spread to 6 in.

Mass., Boston—P. O. Box 1681—9 to 11 in. engine lathe.

Mass., East Cambridge (mail Boston)—Peter Gray & Sons Inc., 286 Third St., double action press, 25 ton capacity, not geared, die space 8 in., stroke of slide 3 in., hole in bed 10 in.

Mass., Hyde Park (Boston P. O.) — F. Kinkel & Son, 10 Wolcott St.—machinery and equipment for blacksmith shop.

Mass., Lowell—T. F Clark, 35 Oak St.—miscellaneous tools and equipment for proposed garage and repair shop. Estimated cost $40,000.

Mass., North Attleboro — Universal Car Co., South Main St., Attleboro—miscellaneous tools and equipment for proposed repair shop, here.

Mass., Roxbury (Boston P. O.)—S. Rudnick, 1322 Tremont St.—miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $75,000 to $100,000.

Mass., Winchester — W. R. Marshall, 19 Ridgefield Rd. — miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $45,000.

O., Cincinnati—A. Ward, 1337 Bates Ave. —3 ft. radial drill, Universal tool grinder, hack saw, No. 4 milling machine and 16 x 6 in. foot engine lathe.

O., Cleveland—Bd. of Education, T. G. Hogen, Dir., Rockwell and East 6th St.—will receive bids until Sept. 12 for machinery and equipment for shop at Collinwood High School.

O., Mt. Gilead—Stauffer Motor Sales Co., D. Stauffer, Gen. Mgr.,—drill press, reaming machine and other equipment for proposed 2 story, 47 x 138 ft. repair and service garage. Estimated cost $50,000.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg.—one 125 ton ladle crane and one 25 ton overhead crane.

Que., Montreal — Guidon & Frere, 6807 Delormier Ave. — complete equipment for proposed garage and repair shop.

Opportunities for Future Business

Conn., Bridgeport—F. L. Mills Co., 2316 Fairfield Ave., is receiving bids for the construction of a 1 story, 100 x 200 ft. repair and service garage on Dewey Sq. Fletcher-Thompson Inc., 542 Fairfield Ave., Archt. Noted Aug. 25.

Conn., Springdale — Stamford Rolling Mills, manufacturers of raw brass, plans to rebuild mill recently destroyed by fire. Estimated cost $40,000. Fletcher-Thompson Inc., 542 Fairfield Ave., Bridgeport, Archt.

Ill., Chicago — Chicago-Nash Co., 2431 South Michigan Ave., is having plans prepared for the construction of a 3 story, 200 x 316 ft. and 170 x 376 ft. service station at Prairie and Indiana Aves. and 24th St. Estimated cost $500,000.

Ind., Muncie—Indiana Steel & Wire Co., is receiving bids for the construction of three 1 and 2 story factory buildings on East Main St. Estimated cost $55,000.

Ia., Sioux City—Sioux City Gas & Electric Co., Commerce Bldg., awarded contract for the construction of a 2 story, 150 x 220 ft. service building. Estimated cost $300,000. Noted Aug. 4.

Me., Rockland — New England Public Service Corp., G. C. Welch, Augusta, awarded contract for the construction of a 1 story garage and repair shop, here. Estimated cost $40,000.

Mass., Arlington (Boston P. O.)—J. J. O'Brien, Massachusetts Ave., is receiving bids for the construction of a 1 story garage and repair shop. Estimated cost $40,000. Private plans.

Mass., Boston—Packard Motor Car Co., East Grand Blvd., is having sketches made for the construction of a 1 story sales and service garage and repair shop. A. Kahn, Inc., Marquette Bldg., Detroit, Mich., Archt.

Mass., Boston — Public Garage, awarded contract for the construction of a 2 story, 225 x 265 ft. garage at Gainsboro and St. Botolph Sts. Estimated cost $300,000.

Mass., Brockton—P. Wychunas, 50 Ames St., Montello, awarded contract for the construction of a 1 story garage and welding shop at Montello and Ames Sts. Estimated cost $40,000. Noted July 14.

Mass., Brookline (Boston P. O.)—Cadillac Motor Car Co., 2860 Clark St., Detroit, Mich., is receiving bids for the construction of a 2 story sales and service station and repair shop at Commonwealth Ave. and Essex St. A. Kahm, Inc., Marquette Bldg., Detroit, Mich., Archt.

Mass., Cambridge (Boston P. O.)—McSorley Bros., 456 Broadway, awarded contract for the construction of a 1 story repair and service garage on Broadway. Estimated cost $45,000. Noted Aug. 18.

Mass., Chelsea (Boston)—H. B. Cloper, 472 Broadway, will build a 1 story, 70 x 175 ft. repair and service garage at 62 Broadway. Estimated cost $50,000.

Mass., Dorchester—Fields Corner Garage will build a 1 and 2 story garage and repair shop at Dorchester Ave. and Faulkner St. Estimated cost $40,000.

Mass., Lynn—General Electric Co., 920 Western Ave., awarded contract for the construction of a 1 story addition to plant. Noted Mar. 10.

Mass., Malden (Boston P. O.)—Palmer-Mullin Co., 60 Franklin St., is having sketches made for the construction of a 2 story shop. Estimated cost $40,000. C. F. Springall, 84 Sprague St., Archt.

Mass., Medford (Boston P. O.)—L. Risman, 85 Central St., awarded contract for the construction of a 1 story repair and service garage on Salem St. Estimated cost $50,000.

Mass., New Bedford—City, E. F. Dahill, Ch. of Fire Dept., Purchase St., is having plans prepared for the construction of a 2 story repair shop. C. Hammond & Son, 170 North Water St., Archts.

Mass., Somerville (Boston P. O.)—Edison Electric Illuminating Co., 39 Boylston St., Boston, awarded contract for the construction of a 1 story addition to service station on Willow St., here. Noted Aug. 4.

Mass., Springfield—A. C. Behr, 44 Vernon St., is having preliminary plans prepared for the construction of a garage on Columbus Ave. H. C. Hearne, 1387 Main St., Archt.

Mass., Springfield — Package Machinery Co. awarded contract for the construction of a 1 story, 37 x 112 ft. plant.

Mass., West Roxbury (Boston P. O.) — Owner, c/o A. J. Carpenter, 1 Moss Hill Rd., Jamaica Plain, Archt., is receiving bids for the construction of a 1 story repair and service garage on Willow St., here. Estimated cost $40,000.

Mo., Kansas City—Kansas City Public Service Co., 15th St. and Grand Ave., will build a 1 and 2 story, 75 x 135 ft. warehouse and electric welding shop, etc., at 40th and Summit Sts. Private plans.

N. J., Newark — Tung-Sol Lamp Works Inc., 95 8th Ave., plans the construction of addition to plant at High St. and 7th Ave. Estimated cost $60,000. Architect not selected.

N. Y., Flushing — New York City Airport Inc., T. E. Donovan, 51 East 42nd St., has work under way on the construction of an airport including hangars, machine shops, etc. Estimated cost $250,000. L. C. Smith, 444 Jackson Ave., Long Island City, Engr.

N. Y., Perth Amboy — Heff Airplanes Inc., J. R. Crouse, Treas., 231 Walter St., plans the construction of a factory on Pardee Tract. Estimated cost $50,000. Architect not selected.

N. Y., Syracuse—J. F. O'Connor Sales Co., Cherry St., awarded contract for the construction of a 3 story sales and service station. Estimated cost $225,000.

N. Y., Syracuse — Smith Home Appliances Inc., H. H. Elmer, Pres., manufacturers of home electrical appliances, plans the construction of a new plant on Thompson Rd.

O., Celina—Celina Specialty Co., manufacture of furniture, plans to rebuild factory recently destroyed by fire. Estimated cost $50,000 to $75,000.

O., Cleveland—The Cleveland Punch & Shear Co., W. C. Sayle, Gen. Mgr., 3917 St. Clair Ave., awarded contract for the construction of a 1 and 3 story, 66 x 157 ft. addition to factory. Estimated cost $100,000.

O., Galion — Ditwiler Mfg. Co., manufacturers of steel truck bodies, plans the construction of a 1 story, 150 x 600 ft. factory to replace fire loss. Estimated cost $100,000.

Pa., Philadelphia — J. G. Lorenz Corp., 1011 Chestnut St., manufacturers of steel products, awarded contract for the construction of a 1 and 2 story, 50 x 268, 40 x 97 and 33 x 97 ft. factory and warehouse at 33rd and Reed Sts. Estimated cost $100,000. Private plans. Noted Aug. 25.

R. I., Phillipsdale — American Electric Works, awarded contract for the construction of a machine shop.

R. I., Providence — The Beacon Warehousing Trust, 79 Milk St., Boston, Mass., awarded contract for the construction of a 1 story, 100 x 200 ft. sales and service station and repair shop on North Main and Caroline Sts. here.

R. I., Providence—J. Ernstof, 94 Dorrance St., awarded contract for the construction of a 1 and 2 story garage and repair shop at Westminster and Washington Sts. Estimated cost $50,000.

Tex., San Antonio — Goad Motor Co., Navarro and Augusta Sts., will soon award contract for the construction of a 2 story, 165 x 167 ft. garage at Dallas and Lexington Sts. Estimated cost $140,000. H. P. Smith, National Bank of Commerce Bldg., Archt. and Engr. Noted Aug. 4.

Va., Richmond — The Gravely Novelty Furniture Co., Martinsville, plans to rebuild plant recently destroyed by fire here. Estimated cost $15,000.

Wis., Green Bay—The LaPlant Hatchery Co., 1530 Elm St., awarded contract for the construction of a 2 story, 34 x 100 ft. shop. Private plans.

Wis., Green Bay—Nelson Machinery Co., 131 Pearl St., awarded contract for the construction of a 1 story, 40 x 60 ft. machine shop.

Wis., Green Bay—W. E. Shew, 126 South Pearl St., plans the construction of a 1 story, 60 x 90 ft. pattern shop. Architect not selected.

Wis., Milwaukee—J. T. Ellison, 514 Coswell Blk., awarded contract for the construction of a 2 and 3 story, 375 x 450 ft. garage at 37th and Wisconsin Sts. Estimated cost $1,100,000. Noted Aug. 18.

Wis., Milwaukee — Netter Heiser & Co., 704 Wisconsin Ave., awarded contract for the construction of a 1 story, 120 x 230 ft. garage at 5000 Lisbon Ave. Estimated cost $50,000.